

Historic, Archive Document

Do not assume content reflects current
scientific knowledge, policies, or practices.

aTC425
.T7U5

WATERSHED WORK PLAN

TRINCHERA WATERSHED

COSTILLA COUNTY
COLORADO



PREPARED UNDER THE AUTHORITY OF THE WATERSHED PROTECTION
AND FLOOD PREVENTION ACT (PUBLIC LAW 566, 83RD CONGRESS,
68 STATUTE, 666) AS AMENDED

OCTOBER 1975

AD-33 Bookplate
(1-63)

NATIONAL

**A
G
R
I
C
U
L
T
U
R
A
L**



LIBRARY

ADDENDUM

October 1975

WATERSHED WORK PLAN

TRINCHERA WATERSHED
Costilla County
Colorado

U. S. DEPT. OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY

JUN 16 1976

CATALOGING - PREP.

CONTENTS

INTRODUCTION

PART 1 -- Discount rate comparison

PART 2 -- Display of impacts to national economic development, environmental quality, regional development and social well-being accounts.

PART 3 -- Display of the abbreviated environmental quality alternative

INTRODUCTION

This addendum is based on procedures established for application of the Water Resources Council's Principles and Standards to implementation studies in process.

Part 1 of this addendum shows the effect of evaluating the structural measures using current installation costs and the current discount rate.

Part 2 displays the effects of the selected plan as evaluated for each of the separate accounts - National Economic Development, Environmental Quality, Regional Development, and Social Well-Being. Values for costs, prices, and rates are those of the work plan.

Part 3 displays an abbreviated alternative plan developed to emphasize environmental quality. Bases for costs, prices, and rates are those of the work plan.

DISCOUNT RATE COMPARISON

This Addendum shows the effect of an interest rate change from 5-7/8 percent to 6-1/8 percent.

- | | | |
|----|--|-----------|
| 1. | Average annual project costs | \$ 50,200 |
| 2. | Average annual project benefits | \$157,600 |
| 3. | The project benefit-cost ratio | 3.1:1.0 |
| 4. | Secondary benefits were not evaluated. | |

SELECTED ALTERNATIVE
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

TRINCHERA WATERSHED
Colorado

Components

Measures of Effects 1/
----- Dollars -----

Beneficial effects:

A. The value to users of increased
outputs of goods and services

- | | |
|---|-----------|
| 1. Irrigation ----- | \$148,670 |
| 2. Utilization of unemployed and under-
employed labor resources | |

Project construction -----	9,160
Total Beneficial Effects -----	\$157,830

Adverse Effects:

A. The value of resources required for a plan

- | | |
|---------------------------------|-----------|
| 1. All measures | |
| a. Project installation ----- | \$ 41,150 |
| b. Project Administration ----- | 6,040 |
| c. OM&R ----- | 1,840 |
| Total Adverse Effects ----- | \$ 49,030 |

Net Beneficial Effects -----	\$108,800
------------------------------	-----------

1/ Average annual

SELECTED ALTERNATIVE
ENVIRONMENTAL QUALITY ACCOUNT

Trinchera Watershed
Colorado

<u>Components</u>	<u>Measures of Effects (Beneficial and Adverse Effects)</u>
A. Area of natural beauty	<ol style="list-style-type: none">1. Concrete line 12.6 miles of canal.2. Install 39 water control structures.3. Realign 7,050 ft. of canal.4. Adequate treatment to protect the land resource base on 2,646 acres of farmland.5. Tree planting on 50 acres of canal right-of-way.
B. Quality consideration of water, land and air resources	<ol style="list-style-type: none">1. Air and water pollution will be increased during construction.2. Air and water pollution will be decreased after construction for the remainder of the project life.3. Tree planting on 50 acres of canal right-of-way will reduce wind velocity at ground level, reducing dust and wind erosion.4. A reduction in wind and water erosion.5. Increased quality of the irrigation water.6. Reduced evaporation rate of irrigation water.
C. Biological resources and Selected Ecosystems	<ol style="list-style-type: none">1. 12.6 miles of canal lining will reduce seepage and change the vegetative growth along the canal banks.2. Canal lining and increased water velocities will make a barrier to movement of some small animals.

SELECTED ALTERNATIVE
ENVIRONMENTAL QUALITY ACCOUNT (Contd)

Trinchera Watershed
Colorado

<u>Components</u>	<u>Measures of Effects (Beneficial and Adverse Effects)</u>
C. Biological, etc (contd)	<ol style="list-style-type: none">3. Realigning 7,050 ft. of canal will cause the removal of 1 acre of large trees.4. Adequate land treatment on 2,646 acres of cropland will insure a diverse vegetative pattern.5. Tree planting on 50 acres of canal right-of-way will provide food and habitat for wildlife.6. Wildlife habitat management on 1,600 acres will provide valuable food and cover for resident wildlife.7. Reduced water loss to seepage from canals will improve water use efficiencies.
D. Historical, archeological and geological	<ol style="list-style-type: none">1. The project will have no effect on historical, archeological, and geological resources.
E. Irreversible or irretrievable commitment	<ol style="list-style-type: none">1. Energy, technology, and raw materials used in installing works of improvement will be irretrievable during the life of the project.

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT

Trinchera Watershed
Colorado

<u>Components</u>	<u>Measures of Effects</u> ^{1/}	
	<u>State of</u> <u>Colorado</u>	<u>Rest of</u> <u>Nation</u>
	-----Dollars-----	
Income		
Beneficial Effects:		
A. The value of increased outputs of goods and services to users residing in the Region.		
1. Irrigation -----	\$148,670	---
2. Utilization of unemployed and underemployed labor resources		
Project Construction -----	9,160	---
Total Beneficial Effects -----	\$157,830	

1/ Average annual.

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT (Contd)

Trinchera Watershed
Colorado

<u>Components</u>	<u>Measures of Effects</u> ^{1/}	
	<u>State of</u> <u>Colorado</u>	<u>Rest of</u> <u>Nation</u>
	-----	Dollars -----
Income		
Adverse Effects:		
A. The value of resources contributed from within the Region to achieve the outputs.		
1. All measures		
a. Project Installation	\$ 18,520	\$ 22,630
b. Project Administration	360	5,680
c. OM&R	1,840	-0-
Total Adverse Effects	<u>\$ 20,720</u>	<u>\$ 28,310</u>
Net Beneficial Effects -----	\$137,110	-\$ 28,310

1/ Average annual.

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT (CONTD)

Trinchera Watershed
Colorado

<u>Components</u>	<u>Measures of Effects</u>	
	<u>State of Colorado</u>	<u>Rest of Nation</u>
Employment		
Beneficial Effects:		
A. Increase in number and types of jobs		
1. Employment for project construction	34.4 semi-skilled jobs for 1 year	---
2. Agricultural employment	14.6 permanent semi-skilled jobs	---
Adverse Effects:		
A. Decrease in number and types of jobs		
1. Lost employment due to a reduction of the Ditch Company's O&M cost	5.8 permanent semi-skilled jobs	---
Net Beneficial Effect -----	34.4 semi-skilled jobs for 1 year.	---
	8.8 permanent semi-skilled jobs	

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT (CONTD)

Trinchera Watershed
Colorado

<u>Components</u>	<u>Measures of Effects</u>	
	<u>State of Colorado</u>	<u>Rest of Nation</u>
Regional Economic Base and Stability		
Beneficial Effects:	Project installation will result in (1) reduction of Operation and Maintenance cost, (2) increased water use efficiencies, (3) reduced pumping cost, and (4) increase in agricultural production. The project will improve the economy of the watershed by creating 34.4 semi-skilled jobs for one year and 8.8 permanent semi-skilled jobs in area designated as depressed.	--

SELECTED ALTERNATIVE
SOCIAL WELL-BEING ACCOUNT

Trinchera Watershed
Colorado

Components

Measures of Effects

Beneficial & Adverse Effects:

A. Real income distribution

1. Create 8.8 man-years of permanent semi-skilled employment.
2. Create regional income benefit distribution of \$148,670. Irrigation benefits by income class as follows:

<u>Income Class</u> <u>-- Dollars--</u>	<u>Percentage of</u> <u>Adjusted Gross</u> <u>Income in Class</u>	<u>Percentage</u> <u>Benefits</u> <u>in Class</u>
Less than 3,000	24	24
3,000 - 10,000	58	58
More than 10,000	18	18

3. Local cost to be borne by region totals \$20,720 with distribution the same as 2. above.

PLAN ELEMENTS ^{1/}

ENVIRONMENTAL EFFECTS

2.6 miles of canal lining.

Realign short reaches of canal (7,050 ft.)

Install 39 water control structures.

Vegetative treatment (grass, shrubs, and trees) on 2,300 acres of canal R.O.W. in the watershed.

Vegetative treatment (grass, shrubs, and trees) on 1,245 acres of road R.O.W. in the watershed.

Provide treatment to protect the resource base and enhance wildlife on 11,450 acres of irrigation cropland; 2,695 acres of wildlife land, and 13,000 acres of rangeland (on-farm land treatment) in the watershed.

Maintain
environment

Provide technical assistance in planning and application of conservation practices in the watershed.

Provide cost share funds for group works of improvement and land treatment measures in the watershed.

Provide technical assistance and cost share to achieve adequate land treatment to protect the resource base on 31,940 acres in the watershed.

Estimated installation costs = \$3,100,000

^{1/} Price base: 1974.

Areas of Natural Beauty

1. The environment will be disrupted during construction activities.
2. Additional plantings of trees and shrubs will provide more diversity to the landscape.

Quality Considerations of Water, Land & Air Resources

1. Air and water pollution will increase during construction activities.
2. Lower ground water table in crop areas.
3. Reduced air and water pollution after construction is completed.
4. Quality of water will improve.
5. There will be reduced erosion on canal and road rights-of-way, and on all other lands in the watershed.
6. Reduced erosion on 31,940 acres in the watershed.

Biological Resources and Selected Ecosystems

1. Maintain high water table in wildlife areas.
2. Provide improved wildlife food and habitat conditions on 31,940 acres in the watershed area.

Geological, Archeological & Historical Resources

1. Maintain historical point of interest in a pleasing setting.

Irreversible and Irretrievable Commitment

1. The energy, technology, and raw materials used in construction activities are irretrievable.

ENVIRONMENTAL QUALITY ALTERNATIVE

Trinchera Watershed
Colorado

OBJECTIVES

PROBLEMS

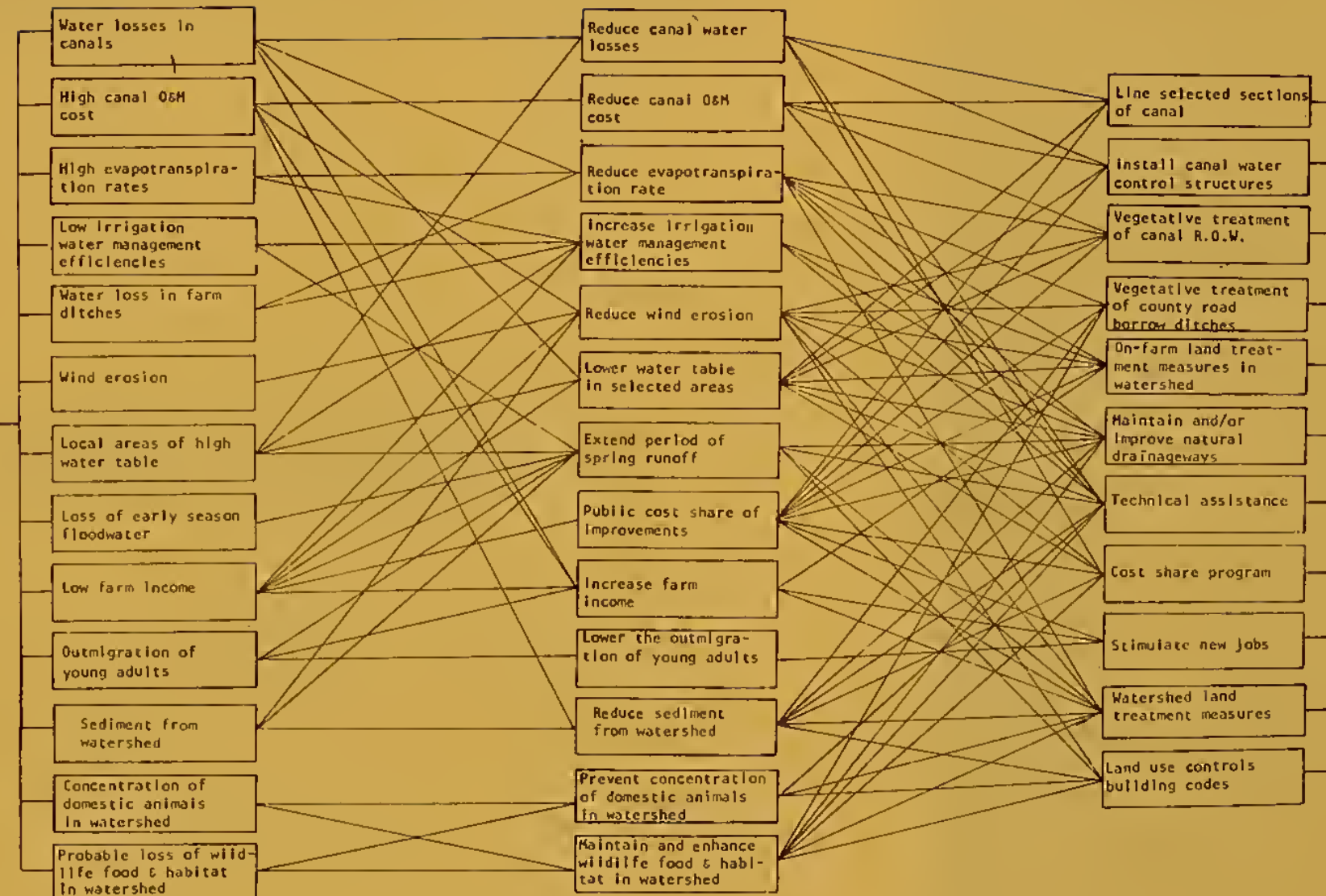
COMPONENT NEEDS

OPPORTUNITIES

PLAN ELEMENTS ^{1/}

ENVIRONMENTAL EFFECTS

Maintain and enhance
environmental quality



12.6 miles of canal lining.
Realign short reaches of canal (7,050 ft.)
Install 39 water control structures.
Vegetative treatment (grass, shrubs, and trees) on 2,300 acres of canal R.O.W. in the watershed.
Vegetative treatment (grass, shrubs, and trees) on 1,245 acres of road R.O.W. in the watershed.
Provide treatment to protect the resource base and enhance wildlife on 11,450 acres of irrigation crop-land; 2,695 acres of wildlife land, and 13,000 acres of rangeland (on-farm land treatment) in the watershed.
Provide technical assistance in planning and application of conservation practices in the watershed.
Provide cost share funds for group works of improvement and land treatment measures in the watershed.
Provide technical assistance and cost share to achieve adequate land treatment to protect the resource base on 31,940 acres in the watershed.
Estimated installation costs = \$3,100,000

^{1/} Price base: 1974.

- Areas of Natural Beauty**
1. The environment will be disrupted during construction activities.
 2. Additional plantings of trees and shrubs will provide more diversity to the landscape.
- Quality Considerations of Water, Land & Air Resources**
1. Air and water pollution will increase during construction activities.
 2. Lower ground water table in crop areas.
 3. Reduced air and water pollution after construction is completed.
 4. Quality of water will improve.
 5. There will be reduced erosion on canal and road rights-of-way, and on all other lands in the watershed.
 6. Reduced erosion on 31,940 acres in the watershed.
- Biological Resources and Selected Ecosystems**
1. Maintain high water table in wildlife areas.
 2. Provide improved wildlife food and habitat conditions on 31,940 acres in the watershed area.
- Geological, Archeological & Historical Resources**
1. Maintain historical point of interest in a pleasing setting.
- Irreversible and Irrecoverable Commitment**
1. The energy, technology, and raw materials used in construction activities are irretrievable.

WATERSHED WORK PLAN

TRINCHERA WATERSHED Costilla County, Colorado

Prepared under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666) as amended.

Prepared by:

Costilla Soil Conservation District
Trinchera Irrigation Company
Costilla County Board of Commissioners
Colorado State Soil Conservation Board

with assistance by

U.S. Department of Agriculture - Soil Conservation Service
and
Forest Service
State of Colorado Water Conservation Board and State Forester

October 1975

TABLE OF CONTENTS

	<u>Page</u>
WATERSHED WORK PLAN AGREEMENT -----	i-vi
<u>WATERSHED WORK PLAN</u>	
SUMMARY OF PLAN -----	1
WATERSHED RESOURCES - ENVIRONMENTAL SETTING	
Physical Data -----	4
Soils -----	4
Geology -----	6
Water Resources -----	6
Economic Data -----	7
Wetlands -----	8
Fish & Wildlife Resources -----	8
Recreational Resources -----	9
Archeological and Historical -----	9
Soil, Water & Plant Management Status -----	9
WATER & RELATED LAND RESOURCE PROBLEMS	
Land Treatment -----	14
Floodwater Damage -----	14
Erosion & Sediment Damage -----	14
Drainage -----	15
Irrigation -----	15
Municipal & Industrial Water -----	15
Recreation -----	16
Fish & Wildlife -----	16
Economic & Social -----	16
Other -----	16
PROJECTS OF OTHER AGENCIES -----	17
PROJECT FORMULATION	
Objectives -----	17
Environmental Considerations -----	18
Alternatives -----	18
WORKS OF IMPROVEMENT TO BE INSTALLED	
Land Treatment Measures -----	19
Structural Measures -----	20
EXPLANATION OF INSTALLATION COSTS -----	
Land Treatment Measures -----	21
Structural Measures -----	21
Construction Costs -----	21

TABLE OF CONTENTS (CONTD)

Engineering -----	21
Land Rights -----	21
Project Administration -----	22
Cost Allocation -----	22
Cost Sharing -----	22
Fiscal Year Obligations -----	22
 EFFECTS OF WORKS OF IMPROVEMENT	
Land Treatment -----	23
Structural Measures -----	24
Fish, Wildlife & Recreation -----	24
Archeological, Historical & Scientific -----	25
Economic & Social -----	25
 PROJECT BENEFITS	
Unevaluated Benefits -----	25
 COMPARISON OF BENEFITS & COSTS -----	26
 PROJECT INSTALLATION -----	26
Land Treatment Measures -----	26
Structural Measures -----	27
Methods of Installation -----	29
 FINANCING PROJECT INSTALLATION	
Land Treatment Measures -----	31
Structural Measures -----	31
 PROVISIONS FOR OPERATION & MAINTENANCE	
Land Treatment Measures -----	32
Structural Measures -----	32
 TABLES -----	33-38
 INVESTIGATIONS & ANALYSES	
Land Use & Treatment -----	39
Water Supply -----	39
Water Requirements -----	40
Canal Design -----	40
Geology & Soils -----	41
Engineering -----	41
Fish, Wildlife & Recreation -----	41
Environmental Assessment -----	41
Economic Investigations -----	41

TABLE OF CONTENTS (CONTD)

MAPS & EXHIBITS

Figure 1.--Drawing of Typical Parshall Flume
and Lined Canal Section

Figure 2.--Typical Lined Canal Section

General Soil Map

Land Use Map

Project Map

WATERSHED WORK PLAN AGREEMENT

between the

Costilla Soil Conservation District
Local Organization

Trinchera Irrigation Company
Local Organization

Costilla County Board of Commissioners
Local Organization

Colorado State Soil Conservation Board
Local Organization

(hereinafter referred to as the Sponsoring Local Organizations)

State of Colorado

and the

Soil Conservation Service
United States Department of Agriculture
(hereinafter referred to as the Service)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsoring Local Organizations for assistance in preparing a plan for works of improvement for the Trinchera Watershed, State of Colorado, under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666) as amended; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Service; and

Whereas, there has been developed through the cooperative efforts of the Sponsoring Local Organizations and the Service a mutually satisfactory plan for works of improvement for the Trinchera Watershed, State of Colorado, hereinafter referred to as the Watershed Work Plan which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Sponsoring Local Organizations and the Secretary of Agriculture, through the Service, hereby agree on the Watershed Work Plan, and further agree that the works of improvement as set forth in said plan can be installed in about five years.

It is mutually agreed that in installing and operating and maintaining the works of improvement substantially in accordance with the terms, conditions, and stipulations provided for in the Watershed Work Plan:

1. The Sponsoring Local Organizations will acquire, with other than P.L. 566 funds, such land rights as will be needed in connection with the works of improvement.
(Estimated cost: \$8,720.)
2. The Sponsoring Local Organization assures that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsoring Local Organization and the Service as follows:

	<u>Sponsoring Local Organization</u> (percent)	<u>Service</u> (percent)	<u>Estimated Relocation Payment Costs</u> (dollars)
Relocation Payments	60.2	39.8	0 <u>1/</u>

- 1/ Investigation has disclosed that under present conditions, the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost shared in accordance with the percentages shown.

3. The Sponsoring Local Organization will acquire or provide assurance that landowners or waterusers have acquired such water rights pursuant to State law as may be needed in the installation and operation of the works of improvement.
4. The percentages of construction costs of structural measures to be paid by the Sponsoring Local Organization and by the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organization (percent)</u>	<u>Service (percent)</u>	<u>Estimated Construction Cost (dollars)</u>
Canal lining with structures for water control	50	50	459,260

5. The percentages of the engineering costs to be borne by the Sponsoring Local Organization and the Service are as follows:

<u>Works of Improvement</u>	<u>Sponsoring Local Organization (percent)</u>	<u>Service (percent)</u>	<u>Estimated Construction Cost (dollars)</u>
Canal lining with structures for water control	0	100	64,300

6. The Sponsoring Local Organization and the Service will each bear the costs of Project Administration which it incurs, estimated to be \$4,600 and \$73,500, respectively.
7. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.
8. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.
9. The Sponsoring Local Organization will be responsible for the operation and maintenance of the structural works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

10. The costs shown in this agreement represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.
11. This agreement is not a fund obligating document. Financial and other assistance to be furnished by the Service in carrying out the watershed work plan is contingent on the availability of appropriations for this purpose.

A separate agreement will be entered into between the Service and the Sponsoring Local Organization before either party initiates work involving funds of the other party. Such agreement will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. The watershed work plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement. The Service shall promptly notify the Sponsoring Local Organization in writing of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsoring Local Organization or recoveries by the Service under projects terminated for cause shall be in accord with the legal rights and liabilities of the parties.
13. No member or delegate to congress, or resident commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.
14. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 C.F.R. 15.1-15.12) which provide that no person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any activity receiving federal assistance.
15. This agreement will not become effective until the Service has issued a notification of approval and authorize assistance.

Costilla Soil Conservation District
Local Organization

San Luis 81152
Address Zip Code

By Castellon
Title President
Date Oct 22-1975

The signing of this agreement was authorized by a resolution of the governing body of the Costilla Soil Conservation District adopted at a meeting held on Oct 22-1975.
Local Organization

Lyle Smith
Secretary, Local Organization
Date Oct 22-1975

Blanca 81123
Address Zip Code

Trinchera Irrigation Company
Local Organization

Blanca Colo 81123
Address Zip Code

By Lyle Smith
Title President
Date Oct 24 1975

The signing of this agreement was authorized by a resolution of the governing body of the Trinchera Irrigation Company adopted at a meeting held on Oct 24 1975.
Local Organization

George Kungu
Secretary, Local Organization
Date Oct 24, 1975

Blanca Col. 81123
Address Zip Code

Costilla County Board of Commissioners
Local Organization

San Luis 81152
Address Zip Code

By Arden Pacheco
Title Chairman
Date Nov 3, 1975

The signing of this agreement was authorized by a resolution of the governing body of the Costilla County Board of Commissioners adopted at a meeting held on Nov 3, 1975.
Local Organization

J. Carlos Sanchez
Secretary, Local Organization
Date 11/3/75

Box 318 San Luis, CA 81152
Address Zip Code

Colorado State Soil Conservation Board
Local Organization

Denver Colo 80203
Address Zip Code

By Ross E Chambers
Title President
Date Nov 3, 1975

The signing of this agreement was authorized by a resolution of the governing body of the Colorado State Soil Conservation Board adopted

at a meeting held on Nov 3, 1975 Local Organization

O. Kenneth Kirkpatrick
Secretary, Local Organization

Denver Colo 80203
Address Zip Code

Date Nov 3, 1975

Appropriate and careful consideration has been given to the environmental aspects of this project.

Soil Conservation Service
United States Department of Agriculture

Approved by:

W. W. Burdick
State Conservationist

11-10-75
Date

WATERSHED WORK PLAN

TRINCHERA WATERSHED Costilla County, Colorado

October 1975

SUMMARY OF PLAN

The work plan for Agricultural Water Management in the Trinchera Watershed is sponsored by the Costilla Soil Conservation District, the Trinchera Irrigation Company, the Costilla County Board of Commissioners, and the Colorado State Soil Conservation Board. Technical assistance in the preparation of the plan was provided by the Soil Conservation Service, U.S. Department of Agriculture and the Colorado Soil Conservation Board. This 31,940-acre watershed is located in southcentral Colorado, in the eastern part of the San Luis Valley and is part of the Rio Grande Basin.

Principal watershed problems are low income and an inadequate usage of natural resources resulting from inefficient irrigation water management on individual farms, high canal seepage loss in the upper reaches of the system, and deteriorated control structures. These problems result in high operation and maintenance costs, and reduced delivery efficiencies. High quality water is not in short supply since supplemental water is available by pumping. However, crop production is reduced because of inadequate late season surface irrigation water and the farm operators' decision not to start his pumps due to the high pumping costs involved for a single "last" irrigation.

The primary project objective is to alleviate these problems by a combination of land treatment and structural measure installation, thereby improving the social and economic stability of the local communities. Improving land and water use efficiencies will reduce operation and maintenance, and groundwater pumping costs. Canal erosion will be eliminated in various reaches of the system, thus reducing maintenance costs.

A five-year installation period is proposed for the land treatment and structural measures required to achieve the project objectives. The estimated project installation cost, as outlined on Table 1, is \$977,130. The PL 566 share is estimated at \$388,520; other funds will bear an estimated \$588,610.

Proposed land treatment measures will be applied on private lands by the owners and operators. Measures installed on irrigated cropland and lateral ditch systems served by the main canals will provide agricultural water management benefits. The cost for land treatment measures

Summary

is estimated to be \$366,750. Of this, PL 566 funds will be used for additional technical assistance to accelerate the rate of installation of land treatment measures, \$18,090 by the Soil Conservation Service and \$3,000 by the U.S. Forest Service. Other funds will bear the remainder including \$11,360 by the Soil Conservation Service and \$1,200 by the Forest Service of regular program funds for technical assistance for continuing the existing programs. (Table 1) Land treatment measures applied to date by the owners and operators are estimated to represent a cost of \$721,340. (Table 1A).

The structural program includes: (1) concrete lining of approximately 12.6 miles of canal, (2) realignment of short reaches of canal, and (3) replacement of turnouts and water control structures. The project map shows watershed features and structure locations.

The total cost for the structural measures is \$610,380. The Sponsor's share is \$242,950, and the P.L. 566 share is \$367,430. Structural measures costs allocated to agricultural water management amount to \$63.25 per irrigated acre.

Studies indicated that during the project installation period, this agricultural water management project will benefit 94 landowners served by the Trinchera Irrigation Company. Diverted water use efficiencies will increase from 32 percent to 45 percent. During the same period, efficiency of use of pumped water will increase from 41 percent to 50 percent.

The average annual benefit accruing to structural measures will be \$157,830 with an average annual cost of \$49,030, thus providing a benefit-cost ratio of 3.2:1.0.

Sponsor funds for financing construction costs eligible for loan assistance under the Act will be obtained by a watershed loan from the Farmers Home Administration under Section 8 of the Watershed Protection and Flood Prevention Act. Other available State or local sources such as the Four Corners Commission may also be used. Funds for repayment of loans will be provided by assessments on ditch company water shares.

The Trinchera Irrigation Company (sponsor) will be responsible for operation and maintenance of the structural works of improvement on the canals. Annual maintenance costs estimated at \$1,840 will be paid for from annual assessments on ditch company shares.

Land treatment measures applied on private lands will be maintained by the landowners and operators under agreement with the Costilla Soil Conservation District.

Summary

The environmental assessment of the project indicates there will be no significant effect on the human environment. Although canal lining will cause temporary loss of wildlife habitat the plan anticipates 50 acres of tree planting and 1600 acres of wildlife habitat management. This will be achieved through special emphasis of these concerns by SCS Technicians working with the Soil Conservation Districts and the land-owners and operators.

This irrigation system rehabilitation does not constitute a major federal action significantly affecting the human environment. Therefore, no environmental impact statement will be prepared.

WATERSHED RESOURCES - ENVIRONMENTAL SETTING

Physical Data

The Trinchera Watershed is located in the San Luis Valley in south-central Colorado's Costilla County and lies totally within the Costilla ^{1/} Soil Conservation District and San Luis Valley Resource Conservation and Development Project boundaries. This 31,940-acre watershed is in Water Resources Region 13 (Rio Grande and Water Resources Subarea 1301), Rio Grande Headwaters, as delineated by the Water Resources Council.

The watershed is within the service area of the Trinchera Irrigation Company. The irrigation water supply is from pumps, stream diversions, and Mountain Home Reservoir. Nonirrigated lands in the watershed are presently used as wildlife land and rangeland. Much of this nonirrigated area has been subdivided by land developers for speculators and absentee owners; however, development has been very limited.

The town of Blanca which has an estimated population of 110, is within the watershed boundaries. Alamosa, Colorado (pop. est. 7000) is the local major trade center and is 20 miles west of Blanca on U.S. Highway 160. Major transportation routes that serve the watershed area are U.S. Highway 160 (east and west) and Colorado State Highway 159 (north and south). The watershed is also served by the Denver & Rio Grande Western Railroad. Frontier Air Lines serves the area by regularly scheduled flights into Alamosa.

The average elevation of the watershed is 7,800 feet above mean sea level. The irrigated area is a level or nearly level alluvial plain dissected by three principal drainages; Ute, Sangre de Cristo, and Trinchera Creeks. Over 75 percent of the average annual 8 inches of precipitation in this semiarid climate occurs between April and November. Representative seasonal average temperatures for the area are: (1) May - 51°; (2) July - 65°; and (3) September - 55°. There is an average of 95 frost-free days yearly according to the Weather Bureau Station records. Wind velocities are high during spring months and soil blowing is a severe problem when soil is bare. High water tables are present in some parts of the project during the irrigation season.

Soils

The soils are combined into four major groups as shown on the Soils Map and discussed below:

1. Very deep, well drained and moderately well drained loamy soils, more than 20 inches deep over gravel with high to moderate available water capacity. Permeability is moderate (0.6 to 2.0 in/hr) and moderately rapid (2.0 to 6.0 in/hr).

^{1/} The Costilla Soil Conservation District was formed through the consolidation of the Mount Blanca, Culebra and Sanchez Soil Conservation Districts, effective March 23, 1975. Early work on this plan was done through the Mount Blanca Soil Conservation District.

Available water capacity is high (0.13 to 0.18 in/in of soil or more than 7.5 in. per 5-foot soil profile to moderate (0.08 to 0.13 in/in of soil) or 5 to 7.5 in. per 5-foot soil profile.

Soils in this group are in Land Capability Subclasses IIIe and IVe when irrigated. Soil blowing is a potential major management problem.

2. Very deep, poorly drained and somewhat poorly drained loamy soils, more than 20 inches deep over gravel with high to moderate available water capacity. Permeability is moderate (0.6 to 2.0 in/hr) or moderately slow (0.2 to 0.6 in/hr). Available water capacity is high (0.13 to 0.18 in/in of soil) or more than 7.5 in. per 5-foot soil profile to moderate (0.08 to 0.13 in/in of soil) or 5 to 7.5 in. per 5-foot soil profile. The watertable is within 2 feet of the soil surface during the irrigation season.

Soils in this group are in Land Capability Subclasses IIIe, IIIw, IVw and Vw when irrigated. Soil blowing potential and control of the water table are major management problems.

3. Very deep, well drained and moderately well drained loamy soils, more than 20 inches deep over gravel with moderate to low available water capacity. Permeability is moderately rapid (2.0 to 6.0 in/hr). Available water capacity is moderate (averages 0.08 to 0.13 in/in of soil) or 5 to 7.5 in. per 5-foot soil profile to low (averages 0.06 to 0.08 in/in of soil) or 3.5 to 5 in. per 5-foot soil profile.

Soils in this group are in Land Capability Subclasses IIIe and IVe, when irrigated. Soil blowing is a potential major management problem.

4. Very deep, excessively drained and well drained sandy and gravelly loamy soils, more than 10 inches deep over gravel with very low to low available water capacity. Permeability ranges from moderate (0.6 to 2.0 in/hr) to rapid (6.0 to 20 in/hr) but is mostly moderately rapid (2.0 to 6.0 in/hr). Available water capacity is very low (averages less than 0.06 in/in of soil) or less than 3.5 in. per 5-foot soil profile to low (averages 0.06 to 0.08 in/in of soil) or 3.5 to 5 in. per 5-foot soil profile.

Soils in this group are in Land Capability Subclasses IIIe and IVe, when irrigated. Soil blowing is a potential major management problem.

Geology - Geologic formations exposed within the watershed consist of rocks and sediments of Tertiary and Quaternary Age. The upper and lower parts of the watershed are underlain mainly by the Santa Fe Formation of Miocene and Pliocene Age and the middle part of the Alamosa Formation of Pliocene and Pleistocene Age. The Santa Fe Formation consists mainly of sand, gravel, silt, and clay layers with several interbedded basaltic lava flows. These materials are exposed in the extreme upper part of the watershed, east of a north-south fault zone that passes through Fort Garland and west of the Mountain Home Reservoir and in the extreme lower part of the watershed west of a fault zone near Smith Reservoir. The main part of the watershed is underlain by the Alamosa Formation which consists of clay, silt, sand, and gravel sediments deposited for the most part in alluvial fans. Similar sediments of Recent Age mantle the Alamosa Formation.

Water Resources

The Trinchera Watershed has three intermittent, unmodified, and well defined water courses - Ute Creek, Sangre de Cristo Creek, Trinchera Creek - entering from the north and east. The creeks are fed by snow-melt from their headwaters which reach elevations of over 13,000 feet above mean sea level in the Sangre de Cristo mountain range.

The Water Pollution Control Commission, Colorado Department of Health, classifies Trinchera Creek and its tributaries as acceptable for cold water fishing and irrigation use.

Water is diverted from Ute Creek and Sangre de Cristo Creek into the system on a supply and demand basis. Flows exceeding diversion demand follow the natural channels through the watershed and enter Smith Reservoir. These flows contribute to the ground water recharge for the watershed area and to the storage in Smith Reservoir. Flows in these two creeks are utilized to the extent of demand. Ute Creek has a yearly flow of approximately 10,000 acre-feet on a 70 percent chance basis. On the same basis, Sangre de Cristo has a yearly flow of approximately 7,000 acre-feet. During years of low precipitation, the creeks will not flow into the watershed for extended periods. During the late season, all of the available streamflow is frequently diverted, leaving a dry creek below the points of diversion.

Mountain Home Reservoir is located upstream from the irrigated area on Trinchera Creek and stores the runoff reaching this location. Water is released from the reservoir into the irrigation system on a demand basis and can be delivered to nearly all of the irrigated lands through a complex delivery system. Water delivered into the irrigation system from the Mountain Home Reservoir is 2,400 acre-feet yearly on a 70 percent chance basis. A considerable amount of the water produced by the Trinchera Creek Watershed goes into the ground water by seepage from the reservoir and upstream channels.

Watershed Resources

Surface water outflow from the watershed is through Smith Reservoir into Trinchera Creek which is tributary to the Rio Grande. Underground flow patterns for the area have not been defined by the Colorado State Engineer. Based on 10 years of company records (1961 to 1970) 14,200 acre-feet of water is diverted from the three sources into the irrigation system yearly on a 70 percent chance (log-normal distribution) for the period. About 5,200 acre-feet pass downstream during periods when runoff exceeds demand.

There are about 160 irrigation wells in the watershed. These wells supplement the diverted irrigation water supply. The average yearly volume of water pumped is estimated to be 21,100 acre-feet. The ground water table has remained constant except recent studies show a rising trend in the eastern portion of the watershed.

All water diverted or stored by the Trinchera Irrigation Company is under existing water rights held by the Company and under existing State of Colorado laws and regulations.

Economic Data - Land in the watershed is in the private ownership of 94 owners. Irrigated lands total 11,450 acres with approximately 1,800 (idle acres) of this total not farmed yearly. The location and area of the idle land varies from year-to-year. The acreage varies in relation to the projected available water supply, weather conditions, and related farming conditions. Present land use in the watershed is as follows: 8 percent wildlife land; 5 percent woodland; 40 percent rangeland; 36 percent irrigated cropland, and 11 percent other uses.

The watershed is characterized by the production of vegetable crops (potatoes, spinach, carrots, lettuce) malting barley and alfalfa. There are three vegetable grading and packing plants located at Blanca, Colorado. Trucks transport a major portion of the produce to markets throughout the country. Malting barley is delivered approximately 40 miles to storage facilities in Monte Vista, Colorado. Surplus alfalfa is trucked to various markets -- some as far as 300 miles.

The following table shows acres and percents for the irrigated crops grown in the watershed:

<u>Crops</u>	<u>Acres*</u>	<u>Percent</u>
Alfalfa	5,100	53
Barley	2,465	25
Vegetable crops	930	10
Potatoes	<u>1,155</u>	<u>12</u>
Total	9,650	100

*Idle acres not included.



Mountain Home Reservoir on Trinchera Creek

SCS PHOTO 001B-16



SCS PHOTO 001A-13

Below Mountain Home Reservoir, Sangre de Cristo-Trinchera
Diversion Canal on right, Trinchera Canal (lined) to the
left and Feedline Canal in center.

The average value of irrigated land in the watershed is \$300 per acre and rangeland averages \$100 per acre.

This watershed is in the Four Corners Economic Development Region and the San Luis Valley RC&D Project Area. The watershed is located in an economically depressed county. Per capita income in 1970 was \$1,530 which compares to the state income of \$3,106 and water resource subarea income of \$2,358. Of the total families in Costilla County, 34.0 percent had income less than the poverty level in 1970 with 23.0 percent having income less than 75 percent of poverty level. 1/

The latest unemployment rate (2nd Quarter, 1974) is 8.4 percent of the civilian labor force. Projected unemployment rate for the 1st Quarter of 1975 is 7.6 percent. 2/

According to the 1969 Census of Agriculture approximately 12.6 percent of the fulltime farmers in Costilla County had gross sales of \$2,500 or less, 40.6 percent had sales of between \$2,500 and \$9,999, and 46.8 percent \$10,000 and above. Approximately 11.0 percent had sales of \$40,000 and over.

Wetlands - Within the project boundary, there are no areas of Type 3, 4, or 5 wetlands as defined in Wetlands of the United States, U.S. Department of the Interior, Fish & Wildlife Circular No. 39. Project actions will not affect any other existing wetlands.

Fish and Wildlife Resources - The fishery resource in the Smith and Mountain Home Reservoirs is managed by the Colorado Division of Wildlife under a contractual agreement with the Trinchera Irrigation Company, and neither the agreement nor the fishery resource will be adversely affected by the proposed project.

No threatened or endangered wildlife species typically inhabit the area. However, the bald eagle, and perhaps the endangered southern bald eagle, may occasionally frequent the vicinity around the larger reservoirs. Wildlife population in this high desert plain is generally sparse. Band-tailed doves were observed on the east side of the project area. Typical wildlife species present include pheasant, mourning dove, cottontail rabbit, white-tailed jackrabbit, miscellaneous songbirds and various predators, especially coyote. Mule deer are present on the periphery of the project area, mostly on the northern and eastern sides. Population density in the watershed is very low. The Environmental Assessment (January 1975) for Trinchera Watershed contains a detailed listing of wildlife species in the area.

1/ County and City Data Book, 1972. U. S. Department of Commerce.

2/ State of Colorado Employment Statistical Division.



Wildlife habitat along canal

SCS PHOTO 001C-5



Salt Flats Range Site of the High Intermountain
Valleys Land Resource Area.

SCS PHOTO 001D-10

Watershed Resources

The 2,695 acres which are designated as wildlife land within the watershed are primarily bottomland having a moderate cover of woody plants. Willows, rabbitbrush, and greasewood are the principal plants. Wildlife values are enhanced on these lands by the favorable environmental conditions including food, cover and water. Planned management including controlled livestock grazing will do much to improve the overall value of these lands for wildlife. Minimal disturbance of wildlife habitat is an integral part of the plan.

Recreational Resources - Water based recreation is abundant in the San Luis Valley with mountains, streams, reservoirs, and two migratory bird wildlife refuge areas affording fishing and hunting opportunities.

The Mountain Home and Smith Reservoirs are leased to the Colorado Division of Wildlife for public recreation. The Division stocks the reservoirs with rainbow trout on a scheduled basis related to use and availability of fish. The reservoirs fluctuate seasonally with a minimum pool of approximately 100 acre-feet. Fisherman-days of use were estimated by the local Wildlife Conservation Officer as being 10,000/year for Smith and 4,000/year for Mountain Home.

Archeological and Historical - An archeological investigation^{1/} revealed no significant historical or cultural values within the proposed construction area. The report of this investigation was reviewed by the State Historical Society of Colorado,^{2/} The Advisory Council on Historic Preservation, and the Office of Archaeology and Historic Preservation, Interagency Archeological Services Division; conclusions of the report were approved and accepted by these agencies.

The "Sites Survey File" maintained by the Colorado State Archeologist has several sites recorded for Costilla County, Colorado. None of these are in the area for proposed construction of works of improvement. Fort Garland, located adjacent to the project area and in the town of Fort Garland, is listed in the National Register of Historic Places (Federal Register, Volume 38, Number 39, as amended), but will not be affected by the project.

Soil, Water and Plant Management Status - It is expected that irrigated cropland in the watershed will remain in irrigated agriculture. Within the watershed boundary, land developers have begun the subdivision of approximately 13,000 acres of rangeland. The subdivided lots are being purchased by speculators and absentee owners. This land presently has no water rights and, therefore, does not compete with irrigated agriculture for available water. The overall acreage is under comprehensive planning to protect the natural environmental setting.

^{1/} Dr. Michael Nowak, Colorado College, April 1975.

^{2/} The Chairman of the State Historical Society of Colorado is the State Historical Preservation Officer.



Pivot sprinkler irrigation system

SCS PHOTO 0010-3



Surface irrigation system

SCS PHOTO 001C-7

The land treatment program is making progress toward meeting installation needs of the watershed for land, soil and water conservation measures. Most of the lands in agricultural production have been improved and managed to provide best use of the land for production. Land treatment measures presently installed are shown in Table 1A.

A 2,592-acre area affected by a high water table is present above Smith Reservoir. This area would benefit very little from drainage without lowering the water level in the reservoir. Landowners are planting adapted grasses to provide best forage for livestock on this area.

The proposed lining of 12.6 miles of existing canal serving the agricultural land will not significantly affect the availability of known sand, gravel, and pumice resources in the area.

The Soil Conservation Service provides technical assistance to the Costilla Soil Conservation District which serves the project area. The district is stressing the importance of irrigation water management and other land treatment to improve the conservation and utilization of natural resources. Representatives of the district are involved in land use development planning with county commissioners, planning boards and councils.

There are 45 cooperators receiving assistance through the district; 40 have basic plans. About 70 percent of the watershed is covered by agreements. An estimated 80 percent of the total land treatment needs have been applied to date, 75 percent having adequate treatment under present conditions.

Approximately 1,600 acres of forest land occur as small scattered stands or as windbreaks. If site development occurs on subdivided land, the remaining forest land and tree planting will become important for visual quality, watershed protection, and wildlife habitat.

WATER AND RELATED LAND RESOURCE PROBLEMS

The major water and related land resource problems in the watershed are low income and inadequate use of the resources. These problems result from inefficient water management which is due, in part, to high canal seepage losses and deteriorated water control structures, and in part to on-farm water management.

Land Treatment - Because of excessive water losses in the irrigation delivery system, some farm owners and operators have been reluctant to invest in extensive land treatment improvements. Delivery systems or control structures are inadequate and water use efficiencies are low. Production is curtailed somewhat by costs due to increased labor requirements, pumping and maintenance under these conditions.

Most of the soils being farmed in the watershed are moderately to rapidly permeable, and require a high level of cultural management. Soil groups 1, 3, and 4 on the General Soils Map and described in the watershed resource setting are readily susceptible to over irrigation and high water conveyance losses. Land leveling, ditch lining, sprinkler irrigation, improved water management, and other treatment are needed to allow best use of committed resources.

Erosion and sediment problems arising from construction of roads and installation of utilities for the subdivision of approximately 13,000 acres of rangeland in the watershed into five-acre homesites may increase during development of the area. This development also is expected to result in an increased wildfire burn rate.

Floodwater Damage - Floodwater damages do not occur frequently nor are they of sufficient magnitude to constitute a watershed problem. Well defined stream channels and wide flood plains allow minimal damage when excessive flows occur due to rapid snowmelt runoff.

Erosion and Sediment Damage - Erosion and sediment damages are not major problems in the watershed. Principal sediment damage results from infrequent flooding of the unreservoired streams. Sangre de Cristo Creek carries a moderate sand load. Sediment deposited (up to 200 cu. yd./season at or near the Company's diversion point during the irrigation season requires seasonal removal.

Soil losses on idle cropland and rangeland are low (generally between 1 and 5 tons/acre/year) and result mainly from infrequent high intensity storms. Some wind erosion occurs due to the minimal cover development under arid conditions. Watershed topography and climate limit the amount of sheet and rill erosion. Some wind erosion is evident on the irrigated cropland during the early spring and winter seasons.

Problems

Drainage - Areas of the watershed having a seasonal high water table that influences crop production are located along the natural stream channels and near Smith Reservoir. Over much of the adjacent area, water table elevations are influenced by the pool elevation in Smith Reservoir. Drainage is not considered a problem in the watershed.

Irrigation - The water supply for the watershed is primarily from snowmelt runoff in the headwaters of Ute Creek, Sangre de Cristo Creek, and Trinchera Creek. A major part of this snowmelt runoff occurs in the early part of the irrigation season; thus, late season water is not adequate for irrigation needs. There are no storage reservoirs on Ute Creek nor Sangre de Cristo Creek. Trinchera Creek is regulated by Mountain Home Reservoir.

The irrigation system has approximately 26 miles of canals and 45 miles of laterals. Approximately 20 miles are small ditches delivering water to individual land users. There are eight major reinforced concrete diversion structures located throughout the system. These are in generally good condition. Measuring devices are used for water appropriation to the shareholders on the basis of available water. These structures are in fair condition.

The irrigation water delivery system is generally well positioned to serve the irrigated area. However, improvements are needed in various reaches to improve the efficiency of water deliveries. Water losses from the delivery system are high in the upper reaches which were constructed in porous soils. Ditch Company records show water losses of 35 to 65 percent between points of diversion and delivery with a ten year average loss of 49 percent.

The need to deliver available water from the three sources equitably to all users has resulted in an extensive interrelated distribution system with duplicate or level reaches in canals in the upper parts of the system where soils are well drained sands, gravelly sands, and loamy sands. The system is designed to deliver flows from Trinchera Creek to over 90 percent of the irrigated acres. Flows from Ute Creek can be delivered to over 40 percent of the area, and flows from Sangre de Cristo Creek can be delivered to over 80 percent of the area. On-farm distribution and field irrigation efficiencies are presently low. The estimated resulting combined water loss for operation, delivery, and on-farm use is 68 percent.

Municipal and Industrial Water - There are no needs for municipal and industrial water in the area.

Recreation - No regional needs were identified for additional water-based recreation facilities in the 1974 - Interim Colorado Comprehensive Outdoor Recreation Plan prepared by the Colorado Division of Parks and Outdoor Recreation.

Fish and Wildlife - Fish and wildlife habitat is in a relatively stable setting. No threatened or endangered species were identified during reconnaissance in the watershed.

Economic and Social - Costilla County and the watershed have recently been characterized by high out-migration. The population of the county reached a peak of 7,533 in 1940. This was followed by declines in population of 1,466 between 1940 and 1950; 1,848 between 1950 and 1960; and 1,340 between 1960 and 1970. Due to the heavy out-migration of young adults, the percentage of the population in the age group 20-40 is much less than in the state of Colorado or the United States.

The number of farms in Costilla County declined 45 percent between 1964 and 1969. Farm income in the county is low when compared to the State average. Eleven percent of the farms have an income of more than \$40,000 and 56 percent have an income of less than \$5,000. The state average is 14 percent of the farms over \$40,000 and 38 percent under \$5,000.

The number of rural farm families in the watershed area having less than poverty level income is approximately 34 percent. The state average for families earning less than poverty level is approximately 9 percent.

<u>Income</u>	<u>Percent</u>
0 - 2,999	18
3,000 - 4,999	38
5,000 - 7,999	19
8,000 - 9,999	4
10,000 and over	21

Other - Wildfire burn rates in the watershed are less than the State fire loss goal of 0.1 percent per year; however, the rates are expected to increase to one percent within the subdivided areas, should they be developed. Soil blowing and insect and disease control problems could increase with subdivision development.

PROJECTS OF OTHER AGENCIES

The planned works of improvement will not affect projects of other agencies and projects of other agencies will not affect this project.

PROJECT FORMULATION

The Superintendent of the Trinchera Irrigation Company formulated a Plan of Improvement in 1967. A group conservation plan was finalized with the Costilla Soil Conservation District in 1968. Both of these documents have been used in the formulation of this Trinchera Watershed Work Plan to meet the objectives of the local sponsors which can be developed within the provisions of PL 566. Land treatment and structural measures selected for inclusion in the project are those that meet most of the project objectives at the lowest annual cost. Final selection of project measures included in this plan was made by the project sponsors with assistance from the Soil Conservation Service.

Discussions with landowners and operators, Trinchera Irrigation Company personnel, and other waterusers indicate that their primary objective is to reduce operation and maintenance costs and increase irrigation water use efficiency in the watershed. Implementation of project measures will provide an opportunity for more intensive land use, and the economy of the area will be improved and stabilized.

In June 1973 a reconnaissance of recreational and wildlife conditions and opportunities was made with personnel from the Fish and Wildlife Service in cooperation with the Colorado Division of Wildlife and the State Biologist for the Service. A representative of the Colorado State Forester examined the watershed to determine conditions and needs for treatment. Existing water resource plans for the watershed and adjacent area were reviewed to assure compatibility with development of the region.

Meetings were held in October, November, and December 1971 with the Directors of the Trinchera Irrigation Company and other local and interested parties and agencies to consider programs and proposals for the project. On December 7, 1971 the Sponsors selected the PL 566 program for planning and construction assistance. The Preliminary Draft Work Plan was reviewed with the sponsors on April 19, 1974.

Objectives - The Sponsors' goal is to improve irrigation water use efficiencies, enhance wildlife habitat, reduce operation and maintenance costs, reduce wind and water erosion, and generally to improve the local economy. Their goal is to increase the level of application of needed

Project Formulation

treatment during the installation period to achieve adequate treatment on 95 percent of the cropland and on 90 percent of the other lands in the watershed. With this, they expect to reduce operation and maintenance costs by nearly one-half, improve diverted flow efficiencies by 13 percent, and ground water utilization efficiencies by 9 percent.

Another Sponsor goal is to improve wildlife habitat by management and tree and vegetative plantings for wildlife in the area. Tree plantings will help meet the goal of reducing wind velocities, and thus erosion and evaporation losses.

Changes in irrigated land use are expected to be minimal. A major part of the present rangeland is planned for subdivision for homesites of approximately five acres each. The Sponsors' wish to maintain low wildfire burn rates with a modest acceleration of fire control.

Environmental Considerations - Air, noise, and water pollution will increase during periods of construction. The vegetative growth will be changed along the canal banks where concrete lining is installed. Fifty acres of tree plantings and revegetation of the construction sites will reduce wind erosion and provide wildlife habitat for the remainder of the project life. Adequate land treatment will insure a diverse vegetative pattern.

The displacement of people, businesses, or farm operations were not an environmental consideration in project formulation since there will be none.

Alternatives - The application and installation of land treatment measures alone would neither provide a sufficient reduction in operation and maintenance costs nor adequately increase the water use efficiencies to meet the Sponsors' primary objectives.

Pumping all of the irrigation water requirement for the watershed was discussed as a means to meet Sponsors' objectives. The alternative was not pursued because of the high cost of new and larger wells, the question of obtaining adequate recharge to the ground water aquifer and the questionable availability of well permits in the area under present State regulations. Consideration of possible future energy shortages and increased costs also made pumping less attractive.

Developing additional irrigation water storage facilities was considered. The Trinchera Irrigation Company has, with assistance from the Soil Conservation Service and others, searched for feasible reservoir sites on Ute Creek and Sangre de Cristo Creek without success.

The land treatment and structural alternatives selected by the Sponsors will most nearly achieve their objectives. Lining of canal reaches located in areas of porous soils, and the transportation of the greatest possible volume of irrigation water, provide the best opportunity for reduction of seepage losses. With lining and water control structures installed, water management will improve, pumping costs will be reduced, and operation and maintenance costs will be reduced. Landowners and operators will be able to improve on-farm water management by applying land treatment with SCS and State Forester technical assistance, and by having a more manageable water supply.

WORKS OF IMPROVEMENT TO BE INSTALLED

Land Treatment Measures - Land treatment measures shown in Table 1 include those which are needed and can be applied during the five-year installation period. These measures will provide watershed protection and project benefits through improved land and cover conditions. Land treatment measures are sprinkler irrigation systems, irrigation water management, field ditches, irrigation pipeline, conservation cropping system, pasture and hayland management, land leveling, wildlife upland habitat management, field windbreaks and wildlife plantings.

Conservation plans developed by landowners and operators with assistance from the sponsoring district will designate land treatment measures needed on each farm unit. Technical assistance for these measures is available from the Soil Conservation Service through the District. Information and assistance regarding optimum application of fertilizers and use of pesticides will be provided landowners and operators through the Soil Conservation Districts. Technical forestry assistance will be provided to interested landowners by the Colorado State Forester.

Creation of windbreak and wildlife food and protective plantings will be encouraged on farms through conservation plans developed and revised with owners and operators, Colorado Division of Wildlife, Soil Conservation Service, and the Colorado State Forester.

The forest land in the watershed should be retained and augmented with 50 additional acres of tree planting in forest lands, shelterbelts, recreation sites, homesites, and wildlife developments. These plantings will be made during the project installation period to improve and maintain the multiple benefits from forest and brushlands, and to help stabilize the soil with ground cover. Consultative services will be provided to owners of homesites on the lands presently designated as rangeland. Fire control will be provided to interested landowners and rural fire districts.

Works of Improvement

Land treatment will follow recommendations outlined in the Technical Guide, Section III, Land Use and Treatment Alternatives for the San Luis Valley, Colorado.

Structural Measures - Structural measures shown in Table 2 were selected as the most effective and economical combination to accomplish the Sponsors' objectives. Project structural measures consist of concrete lining for all or part of eight "main" canals with appurtenant water delivery and control structures. The project map shows the layout of the system and measure locations. Table 3 lists general structure data relating to planned improvements by canal name.

Canal lining will be nonreinforced concrete installed by the slip-form construction method to meet applicable SCS standards and specifications. Concrete lining has been used for many years in the San Luis Valley and in the watershed, and is planned to have a 25-year effective life. Standard and commercially available metal gates and Parshall flumes are to be installed for turnouts and control structures. Check structures will utilize timber check boards for water surface elevation control.

Figure 1 is a drawing of a typical Parshall flume and lined canal section. Figure 2 is the profile for Middle Bean Canal which is considered typical of canals to be lined.

Land rights associated with project installation will involve road culvert modifications and fence removal and replacement.

There will be no displacement of people, businesses, or farm operations as a result of the planned works of improvement.

There are no known historical or cultural properties to be protected in the proposed construction areas. However, during construction if evidence of archeological or historical materials is found, work in the area of concern will be stopped. The State Conservationist (SCS) will request the National Park Service to appraise the significance of the find in compliance with Executive Order 11593, Section 6 of the National Historic Preservation Act (P.L. 93-291), and the "Procedures for the Protection of Historic and Cultural Properties" of the Advisory Council on Historic Preservation. This is a federally assisted local project so there will be no change in the existing responsibilities of any federal agency under Executive Order 11593 with respect to archeological and historical resources.

EXPLANATION OF INSTALLATION COSTS

The estimated project installation cost is \$977,130. This cost is composed of land treatment measures estimated at \$366,750, and structural measures estimated at \$610,380. Project installation costs are shown in Table 1. These costs are further defined in the following discussion.

Land Treatment Measures - The installation cost of land treatment measures to be applied are based on present unit costs for each practice and are estimated at \$366,750 over the five-year project period. Landowners and operators will furnish funds and equipment estimated at \$333,100 to apply these measures. Most of the measures are eligible for cost-sharing from funds available under the Great Plains Conservation Program and other programs. Technical assistance, including consultative services, to be provided by the Service is estimated to cost \$18,090 from PL 566 funds, and \$11,360 from regular program funds. Technical assistance for forestry and fire control will be provided to interested landowners and rural fire districts by the Colorado State Forester through cooperative agreement with the U.S. Forest Service. The costs of this service is estimated to be \$3,000 from PL 566 funds, and \$1,200 from regular program funds.

Structural Measures - The estimated installation cost for structural measures is \$610,380 as shown in Tables 1 and 2. This cost includes the estimate for construction, engineering, land rights, and project administration described as follows:

Construction Costs - Project construction costs are estimated to be \$459,260. This consists of the engineer's estimate of the contract cost of construction, plus 15 percent for contingencies. Construction costs were estimated for the canal lining, headgate installations, water control and measuring devices and turnouts. The estimated cost is based on construction quantities from preliminary plans and current unit costs for similar work and facilities in the locality.

Engineering - Engineering costs, estimated to be \$64,300, are to provide surveys, foundation studies, laboratory analysis of materials, structure design, and preparation of construction plans and specifications.

Land Rights - Land rights to be acquired by the Sponsors are estimated to cost \$8,720. The structural work, as planned, is either within the existing rights-of-way of the irrigation company or will result in a land exchange situation; therefore, no cost is included for land acquisition. Land rights costs are for road crossing culverts, fence removal and replacement, and other similar cost items.

Installation Costs

Project Administration - The cost for administration of the project during installation is estimated to be \$78,100. Estimated Soil Conservation Service cost is \$73,500 and Sponsors' cost is \$4,600. However, each party will bear the cost which it incurs. These costs are for administrative, supervisory, construction layout, and inspection services provided by the Service, and for administrative and supervisory services provided by the Sponsor.

Cost Allocation - The entire project structural measures installation cost is allocated to irrigation. There are no non-project costs associated with the project.

Cost-Sharing - Installation costs for the project will be shared by the local sponsoring organization, which is the Trincheria Irrigation Company (Sponsor) and the federal government under authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666) as amended. Public Law 566 funds will bear 50 percent of the construction cost and 100 percent of the engineering service cost. Other (Sponsor) funds will bear 50 percent of the construction cost and all of the land rights and relocation assistance advisory service costs. The Service and the Sponsor will each provide the portion of the project administration cost which it incurs.

Fiscal Year Obligations - The estimated schedule of expenditures over the five-year installation period is tabulated below by use and source:

Year	Structural		Administration		Land Treatment	
	PL-566	Other	PL-566	Other	PL-566	Other
First	39,975	32,370	10,000	630	2,870	46,980
Second	56,620	47,485	14,100	930	4,060	67,610
Third	63,130	51,470	15,800	940	4,530	74,420
Fourth	55,560	45,585	13,900	900	3,990	65,690
Fifth	78,645	61,440	19,700	1,200	5,640	90,960
TOTAL	293,930	238,350	73,500	4,600	21,090	345,660

The proposed schedule of structure measure installation and expenditures may be adjusted from year-to-year by mutual agreement between the Service and the Sponsor. Adjustments will be based on fund appropriations and the progress of project measure installation. Table 1 shows the distribution of all project installation costs. Table 2 shows the distribution of structural measures costs.

EFFECTS OF WORKS OF IMPROVEMENT

The combination of land treatment and structural measures installed will increase water use efficiencies, reduce operation and maintenance costs, reduce wind and water erosion, and will improve the environment and strengthen the local and regional economy. Primary benefits will accrue to the landowners and operators of approximately 11,450 acres of irrigated agricultural land. Secondary benefits will accrue from increased production of farm products to fertilizer dealers, crop processing firms, truckers, farm equipment dealers, labor, and others supplying materials and services to the area and region. An unevaluated benefit accruing to the project is the more regular cropping of 1,800 normally idle acres.

All landowners and operators in the watershed will benefit from the improvements. With the more manageable surface water supply and improved water use efficiencies, a limited increase in more intensive farming is anticipated, and no new lands will be brought into production as a result of the project. There will be no new water available to the Company through direct diversion, pumping or storage as a result of this project. No water rights will be jeopardized.

Land Treatment - The watershed area and the region will benefit from the application of planned land treatment measures by the general overall improved use of land and water resources. Ninety-four landowners and operators will benefit from the reduced operation and maintenance costs and improved economic and production potential with better water management.

Installation of the project land treatment measures is expected to achieve adequate treatment on an additional 20 percent of the watershed. Effects of applied practices resulting from information provided landowners and operators regarding optimum application of fertilizers and use of pesticides will cause a reduction in the chemical pollution of runoff from agricultural lands.

Sprinkler irrigation systems, land leveling, pipelines, and properly located field ditches, with better operator knowledge of how to use these improvements, will result in more efficient on-farm irrigation water management.

Field windbreaks will reduce surface wind velocity and thus, reduce wind erosion and the evaporation rate of irrigation water. They will provide improved wildlife habitat. Conservation cropping systems, and pasture and hayland management will improve soil tilth and increase its resistance to wind and water erosion.

Effects of Works of Improvement

Technical assistance in wildlife upland habitat management will increase the land operator's knowledge of wildlife requirements and lead to activities to maintain and/or improve the habitat. Consultive services provided to owners of homesites will reduce erosion and sediment damage in these areas.

Forest land fire control and tree planting will help maintain and improve the multiple-use benefits derived from forest lands, help stabilize the soil with ground cover, and support healthy forest stands.

Structural Measures - Project structural measures will be effective in reducing water loss due to seepage, improving irrigation water management, and reducing operation and maintenance costs. Seepage loss reduction will result in an estimated 20 to 30 percent increase in water delivered to the land. This water lost through seepage will become available regularly to irrigate part of the 1,800 acres of land frequently left idle. The hazard of wind erosion will be reduced by the more intensive ground cover created by irrigated crops. However, there will be no change in the wind erosion hazard on the remaining portion of these frequently unirrigated acres. The improved water system will allow more timely water delivery and this will encourage landowners and operators to improve on-farm systems and water management. The overall efficiency is expected to improve 13 percent for diverted flows and increase 9 percent for ground water utilization. These improvements will reduce the amount of pumped water required by 5,019 acre-feet; an operational savings of an estimated \$20,180.

The annual assessment for operation and maintenance costs is expected to be reduced from \$8.00 to \$5.00 per share with the project installed.

Sediment and erosion rates are not considered to be serious; however, they will be reduced by canal lining, land treatment, and by generally improved land and water management.

Fish, Wildlife and Recreation - There are no new recreation and wildlife development measures proposed in the watershed. Improved water use efficiencies will allow retention of more water in Mountain Home Reservoir until later in the season. Water quality for downstream uses will be improved by reducing soil losses on the irrigated area, thus sediment contribution to the Rio Grande. Also more efficient water management will reduce the nutrient loading of the ground water.

Effects on wildlife habitat due to the project will be of a short term nature involving about 12.6 miles of canal lining. Field windbreak plantings are planned to replace losses due to structural measure installation. Wildlife upland habitat management on 1,600 acres is planned.

Archeological, Historical and Scientific - There are no known archeological, historical, or unique scenic sites, or sites listed in the National Register of Historical Places that will be affected by the project measures.

Economic and Social - The economy of the watershed will improve as a result of the project measures installed. Crop production is expected to increase due to a more efficient use of natural resources. Crop yields with and without project are as follows:

<u>Crops</u>	<u>Yield</u>	
	<u>Without Project</u>	<u>With Project</u>
Alfalfa	2.25 tons	2.5 tons
Barley	55 bu.	60 bu.
Spinach	75 cwt.	80 cwt.
Potatoes	250 cwt.	270 cwt.

This increased production is expected to create approximately 9 permanent semi-skilled jobs, which will help the employment situation in the watershed and adjacent area. It is anticipated that these jobs will be attractive to farm families with poverty level income because of the surplus labor in this group.

Project works of improvement will provide primary benefits to 94 land-owners and operators. The increased returns to the farming units will increase their expenditures for improved farming equipment and supplies such as seed and fertilizer. This economic stimulus should provide more employment in businesses serving agriculture and should reduce migration of people from the area.

PROJECT BENEFITS

The total estimated average annual benefits that will accrue to the structural measures is \$157,830. Benefits from a reduction in operation and maintenance are estimated to be \$36,990. The benefit from reduced pumping requirements is estimated to be \$20,180. Redevelopment benefits are estimated at \$9,160. Benefits from increased yields are estimated at \$91,500.

Unevaluated Benefits - Benefits that will accrue to the project, but were not evaluated are: 1,800 acres of occasionally idle land that may be put into crop production more frequently after the project has been installed. These acres are not presently in production unless there is a sufficient supply of water and seasonal and other farming considerations are favorable.

Comparison of Benefits & Costs

Secondary benefits resulting from increased business and services generated by the project were not evaluated.

COMPARISON OF BENEFITS AND COSTS

Estimated total average annual benefits accruing to project structural measures will be \$157,830. The estimated average annual cost of these measures will be \$49,030, including operation and maintenance of \$1,840. The ratio of average annual benefits to costs is 3.2 to 1.0. An average annual benefits to costs comparison is shown in Table 6.

PROJECT INSTALLATION

The project measures are to be installed during a five-year period by the Sponsor and the individual landowners and operators within the watershed. They will be assisted by the Service and other federal, state, and private agencies concerned. Costs for the installation of land treatment and structural measures are being assumed by the Sponsor, landowners, and the Service.

No land purchases are anticipated. All necessary easements will be acquired by donations or land exchange. However, if land acquisition does become necessary, a qualified land appraiser will be consulted before initiation of negotiations.

The landowner or his representative must be given every reasonable opportunity to accompany the appraiser during his inspection of the property. The Sponsors must then establish the amount they believe to be just compensation for the land rights, but in no case less than the appraised value. The Sponsors will then make a prompt offer in writing to acquire the right and include a statement and summary of the basis for the amount established as just compensation.

If landowners desire more compensation and negotiations fail, Sponsors may then instigate condemnation procedures to acquire the needed land rights. The Trinchera Irrigation Company has the Right of Eminent Domain to provide land rights for structural works of improvement.

There are no relocation assistance advisory services or relocation payments involved in this plan.

Land Treatment Measures - Land treatment measures to be installed by the owners and operators during the five-year project period are an integral part of this plan. Agreements will be developed with individual landowners and operators in conjunction with their conservation plan as developed with the Costilla Soil Conservation District.

Structural Measures - The project structural measures are grouped by canal name into five units for establishing a schedule and priority for developing designs and plans, and letting contracts for construction. The proposed groupings and schedules are shown below:

Unit and Construction Year	Structural Measure by Canal Name
1	Parson-Magee
2	Lobato, Whitehead- Escheman, and Grimwood-Smith
3	Newton
4	Bean & Middle Bean
5	Garland

Responsibilities of each organization in the installation of the project works of improvement are as follows:

The Costilla Soil Conservation District will:

1. Be responsible for accelerating the rate of application of land treatment measures including the planning, application and maintenance.
2. Sign project agreements for construction.

The Colorado State Forester will:

1. Provide technical assistance for forestry and fire control to interested landowners and rural fire districts on 31,940 acres at an estimated cost of \$4,400 for installation and \$1,200 for technical assistance.
2. Provide forestry technical assistance to assist in planting 50 acres of trees estimated to cost \$7,500 for installation.

The Soil Conservation Service will:

1. Provide funds for the following at an estimated cost of \$396,880:
 - a. Accelerated technical assistance estimated at \$18,090 will be provided for the preparation of soil surveys and application of conservation treatment measures.

Project Installation

- b. Technical assistance for the on-going program estimated at \$11,360 in addition to the accelerated program.
 - c. Furnish funds for engineering services for irrigation measures estimated at \$64,300 to prepare final designs, cost estimates, and construction specifications in accord with current national and state construction criteria.
 - d. Provide construction funds for structural measures estimated at \$229,630.
 - e. Project administration costs estimated at \$73,500 which include: (a) maintaining close working relations with project sponsors and local state and federal agencies participating in the projects; (b) assisting sponsors by inspecting construction, preparing monthly estimates, and certifying to completion of contracts; and (c) providing assistance and consultation to sponsors in making desirable revisions or amendments to the structural works of improvement.
2. Make required notification of work plan approval to the National Park Service, Midwest Archeological Center.

The Forest Service will:

1. Provide funds estimated at \$3,000 for accelerated technical assistance to Colorado fire protection districts for fire control intensification on private land by the Colorado State Forester.

The Trinchera Irrigation Company will:

1. Exercise the right of eminent domain, if necessary, to provide their land rights obligations. These land rights are estimated at \$1,720 and involve fence removal and replacement.
2. During the first year, provide construction funds and legal fees for Parson-Magee Canal at an estimated cost of \$31,230. The second year provide the same for Lobato, Whitehead-Escheman and Grimwood-Smith at an estimated cost of \$44,235. Third year cost of \$49,320 will be provided for Newton Canal, fourth year Bean and Middle Bean Canals at a cost of \$43,405 and the fifth year Garland Canal construction cost and legal fees will be provided at an estimated cost of \$61,440.
3. Sign project agreement for construction contracts.

The Colorado State Soil Conservation Board will:

1. By request of the other sponsors, the Colorado Water Conservation Board will be the contracting local organization. In addition to the following duties, the Board will provide project administration funds estimated at \$4,600:
 - a. As the contracting local organization for the construction of all structural measures will be responsible for advertising and holding bid openings, letting contracts, inspecting and accepting the completed works of improvement for the sponsoring local organization.
 - b. Providing a local representative to act as liaison between other sponsoring organizations, the contractor, and the Soil Conservation Service.
 - c. Reviewing and approving the final drawings and specifications before bids are advertised.
 - d. Signing the project agreement for each construction contract with other three sponsors.
2. Assist the Costilla Soil Conservation District and other sponsors in the fulfillment of their project responsibilities.
3. Notify the State Liaison Officer, State Historical Society when the work plan is approved and when construction is authorized.

The Costilla County Board of Commissioners will:

1. Modify county road culverts as necessary for installation of project measures. The cost of these modifications is estimated to be \$7,000.

Methods of Installation - Structural measures will be installed under a competitive construction contract.

The Colorado State Soil Conservation Board will provide funds for personnel to negotiate for land rights and be the Contracting Local Organization for letting of construction contracts. The Director will be the local representative of the Sponsoring Local Organizations responsible for dealing with the Service and the contractor in the administration, contracting and completion of construction contracts. The sponsors, in addition to the Costilla Soil Conservation District, will sign project agreements for construction.

Project Installation

Construction will be carried out under guidelines of construction management and equipment control that will minimize erosion and pollution and maintain environmental quality during construction. These specific measures will be included in construction drawings and specifications. When special or unforeseen problems involving pollution or evidence of archeological sites arise during construction, appropriate measures will be taken to control them by contract modification.

Structural measures will be constructed according to the safety and health standards set forth in Safety and Health Regulations for Construction, published by the Bureau of Reclamation, U.S. Department of the Interior, and to conform to all Colorado laws.

All federal and state pollution requirements will be met during and after construction.

FINANCING PROJECT INSTALLATION

Land Treatment Measures - Project land treatment measures will be installed by funds provided by landowners and operators with such cost-sharing assistance that may be available from other programs. The Soil Conservation Service will furnish technical assistance through existing program funds at the current rate. This assistance is available through the Costilla Soil Conservation District.

Installation cost of the fire control and other forestry measures will be borne by landowners and rural fire districts with such cost-sharing assistance that may be available from other programs. The cost of the technical assistance will be provided by the Colorado State Forester and the U.S. Forest Service.

Structural Measures - The Service and the Trinchera Irrigation Company will each pay assigned costs for installation of structural measures. Specific obligations for structural installation costs are stated in the Project Installation section of the work plan.

Structural measure project costs to be furnished by P.L. 566 funds will be paid with funds appropriated under authority of P.L. 566 (83rd Congress, 68 Stat. 666) as amended. Federal financial participation is contingent on availability of federal funds for the P.L. 566 program.

Other funds are to be provided by Trinchera Irrigation Company. Their source of funds may be: (1) assessments on the Trinchera Irrigation Company shares; (2) a loan from the Farmers Home Administration; (3) a grant from the Four Corners Commission; or (4) other sources as may be available. The Sponsor has contacted various loan agencies to determine procedural requirements and availability of funds. They have notified the State Director of FmHA and the Four Corners Commission of their proposed plans. The preliminary application for a PL 566 loan through FmHA was filed on December 23, 1973 in the amount of \$96,000. The Trinchera Irrigation Company will use these funds to help pay for its portion of the construction cost.

Prior to entering into agreements that obligate funds of the Service, the Colorado State Soil Conservation Board will have a financial management system for control, accountability, and disclosure of PL 566 funds received, and for control and accountability for property and other assets purchased with PL 566 funds.

Program income earned during the grant period will be reported on the Sponsor's request for advance or reimbursement from the Service. This work plan is not a financial document for obligation of federal or other funds. The Project Agreement will establish the obligation of federal and other funds for each contract.

PROVISIONS FOR OPERATION & MAINTENANCE

Land Treatment Measures - Land treatment measures will be maintained by the landowners or operators on farms where measures are installed. Technical assistance is available from the Service through the Costilla Soil Conservation District with provisions for operation and maintenance discussed in the cooperative agreement. Technical assistance for the forestry and fire control aspects is available from the Colorado State Forester.

Structural Measures - The project measures have been designed to operate effectively for at least 25 years with proper maintenance. It is expected that some natural or man-induced structural damage will occur to the measures and repair will be needed. This repair and all maintenance of the works of improvement are considered to be operation and maintenance costs.

Structural measures will be operated and maintained by the Trinchera Irrigation Company at an estimated annual cost of \$1,840. This represents materials, labor, and equipment necessary for operation and repair. An operation and maintenance agreement, including the features of the Colorado Watershed and RC&D Operations and Maintenance Handbook will be executed prior to completing a project agreement. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with P.L. 566 financial assistance. A plan for carrying out the operations and maintenance of the structural measures will also be prepared.

Structural works of improvement will be inspected annually. For the first three years after construction, Sponsor and Service representatives will inspect the structural measures. After the third year, the Sponsor will make annual inspections. Inspection reports will be made annually by the Sponsor and kept on file by the Sponsor with copies provided to the Service. The reports will cover maintenance needs, outline what will be done, and establish a schedule for accomplishing the work.

TABLES SECTION

TRINCHERA WATERSHED
Costilla County, Colorado

October 1975

Table 1.--Estimated Project Installation Cost
Trinchera Watershed, Colorado

Installation Cost Item	Unit	Number	Estimated Cost (dollars) 1/						Total
			Fed: Land	Non-Fed: Land	PL-566 FUNDS		OTHER		
					: SCS 3/	: FS 3/	: Total	: Non-Federal Land	
LAND TREATMENT									
Land Area 2/ Cropland	Acres to be treated	2,646	2,646	-	-	-	321,200	-	321,200
Forest Land	Ac	50	-	-	-	-	7,500	7,500	7,500
Fire Control	Ac	31,940	31,940	-	-	-	4,400	4,400	4,400
Technical Assistance									
Land Treatment			11,640	3,000	14,640	11,360	1,200	12,560	27,200
Soil Surveys			6,450	-	6,450	-	-	-	6,450
TOTAL LAND TREATMENT	-	-	18,090	3,000	21,090	332,560	13,100	345,660	366,750
STRUCTURAL MEASURES									
Construction									
Water Control Structures			18,300	-	18,300	18,300	-	18,300	36,600
Canal Lining			211,330	-	211,330	211,330	-	211,330	422,660
Subtotal - Construction			229,630	-	229,630	229,630	-	229,630	459,260
Engineering Services			64,300	-	64,300	-	-	-	64,300
Project Administration									
Construction Inspection			33,000	-	33,000	2,000	-	2,000	35,000
Other			40,500	-	40,500	2,600	-	2,600	43,100
Subtotal - Administration			73,500	-	73,500	4,600	-	4,600	78,100
Other Costs									
Land Rights			-	-	-	8,720	-	8,720	8,720
Subtotal - Other			-	-	-	8,720	-	8,720	8,720
TOTAL STRUCTURAL MEASURES			367,430	-	367,430	242,950	-	242,950	610,380
TOTAL PROJECT			385,520	3,000	388,520	575,510	13,100	588,610	977,130

1/ Price base, 1974.

1/ Price base, 1974.
2/ Includes only areas estimated to be adequately treated during the project installation period. Treatment will be accelerated throughout the watershed and dollar amounts apply to total land areas, not just to adequately treated areas.

3/ Federal agency responsible for assisting in installation of works of improvement.

Table 1A.--Status of Watershed Works of Improvement
(at time of work plan preparation)

Trinchera Watershed, Colorado

Measures	Unit	Applied to date	Total Cost (Dollars) <u>1/</u>
<u>Land Treatment</u>			
Soil Conservation Service			
<u>Irrigated Land</u>			
Irrigated system, sprinkler	Number	17	340,000
Field Ditches	Lin. Ft.	160,000	24,000
Irrigation Pipeline	Lin. Ft.	3,300	6,600
Land Leveling	Ac.	5,829	349,740
TOTAL - Soil Conservation Service		-	720,340
<u>Forest Service</u>			
Fire Control	Ac.	31,940 <u>2/</u>	1,000
TOTAL - Forest Service		-	1,000
GRAND TOTAL			721,340

1/ Price base, 1974.

2/ Shows in Table 1 as needing further treatment.

Table 2.--Estimated Structural Cost Distribution

Trinchera Watershed, Colorado

(Dollars) 1/

Item	Installation Cost		Installation Cost				Total Installation Cost
	PL-566 Funds		Other Funds				
	:		:		:		
	: Total		: Land		: Total		
	: Construction	: Engineering: PL-566	: Construction:	: Rights	: Other	:	
Water Control Structures	18,300	5,125	23,425	18,300	-	18,300	41,725
Canal Lining	211,330	59,175	270,505	211,330	8,720 <u>2/</u>	220,050	490,555
Subtotal	229,630	64,300	293,930	229,630	8,720	238,350	532,280
Project Administration	-	-	73,500	-	-	4,600	78,100
GRAND TOTAL			367,430			242,950	610,380

1/ Price Base, 1974.

2/ For road crossing culverts, fence removal and replacement and other similar costs.

TABLE 3.--STRUCTURE DATA

Canal Lining
Trinchera Watershed, Colorado

Canal System	Non-Reinforced Concrete Lining (100 ft.)	Water Control Structures (No.)	Planned Canal Capacity (c.f.s.)	Average Bottom Width (Ft.)	Average Depth (In.)	Average Slope (Ft/Ft)	Average Canal Velocity (Ft/Sec)	Average Concrete /100 l.f. (Cu.Yd.)	Volume of Concrete (Cu.Yd.)
Garland	106.42	3	25-50	2.5	42	.00074	3.5	11.70	1333.08
Newton	161.55	7	25-40	2.0	28	.0053	5.8	6.54	1056.96
Parson-Magee	104.70	10	20-30	1.5	28	.0051	5.5	6.15	643.97
Middle Bean	90.40	9	20-40	2.0	26	.0057	5.3	7.05	637.95
Bean	39.80	3	20	2.0	24	.0017	3.9	6.61	263.39
Labato	86.80	2	20-25	1.0	26	.00469	5.3	5.77	501.21
Grimwood-Smith	52.95	5	15-25	1.5	24	.0059	5.9	5.60	296.35
Whitehead-Escheman	21.50	0	20	1.0	26	.0037	5.0	5.82	125.20

Table 4.-- Annual Cost
Trinchera Watershed, Colorado
(Dollars) 1/

Evaluation Unit	Amortization of Installation Cost <u>2/</u>	Operation and Maintenance Cost	TOTAL
All Structural Units	41,150	1,840	42,990
Project Administration	6,040	--	6,040
GRAND TOTAL	47,190	1,840	49,030

1/ Price base, 1974.

2/ 25 years @ 5-7/8 percent interest.

Table 6.--Comparison of Benefits and Costs for Structural Measures

Trinchera Watershed, Colorado
(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS 1/					Benefit Cost Ratio
	Irrigated 2/	Costs	Redevelopment	Total	Average Annual Cost 3/	
All Structural Measures	128,490	20,180	9,160	157,830	42,990	3.7:1.0
Project Administration					6,040	
GRAND TOTAL	128,490	20,180	9,160	157,830	49,030	3.2:1.0

1/ Price base: Current normalized prices for agricultural crops and current prices for other values.

2/ Includes benefits to reduced O&M

3/ From Table 4

INVESTIGATIONS & ANALYSES SECTION

TRINCHERA WATERSHED
Costilla County, Colorado

October 1975

INVESTIGATIONS AND ANALYSIS

Land Use and Treatment - Future land use in the watershed includes irrigated cropland, homesites, wildlife land, and miscellaneous uses. Treatment measures were developed by technicians of the Service, and other agencies working with the Costilla Soil Conservation District, and the Sponsor. Specific measures were selected because of their demonstrated effectiveness in improving water and land management. Many factors influence land use and crops grown on the irrigated lands in the watershed. Climate is the major restrictive natural element with cool nights and an average growing season of 95 frost-free days. Soils are generally suitable for the crops grown; however, skill and knowledge are required to manage this resource.

There are approximately 11,450 irrigated acres under the system in the watershed. Of these, approximately 1,800 acres remain idle yearly. The number and location of idle acres varies somewhat in respect to the water supply forecast, season, and other farming conditions. The idled acres are those that generally require more intensive management and are less productive in their present state of treatment. With the improved system, these lands will be placed in production more frequently.

A forestry plan has been developed by the State Forest Service in cooperation with the U.S. Forest Service to provide fire control intensification and tree planting.

Water Supply - The Trinchera Irrigation Company keeps a record of all water delivered to the various canals and ditches by month and total for the year. The ten-year average of water delivered to these canals and ditches is 20,000 acre-feet per year (14,200 acre-feet on a 70 percent chance basis) based on company records from 1961 through 1970. These ten years of monthly records were for the Newton No. 2, Garland Canal Nos. 39 and 71 Ute Creek, Garland Canal Nos. 39 and 71 Sangre Creek No. 38 Martin, Sangre de Cristo No. 3 and 86, Stroupe and Trinchera Feeder.

Public Service Company of Colorado pump test and pumping cost records and Trinchera Irrigation Company records were used to evaluate ground water use. These records show the pumped supply varied from 11,400 ac.ft. in 1958 to 31,450 ac.ft. in 1964. An average of 21,100 ac.ft. of ground water was pumped for the period evaluated.

Sites for additional irrigation water storage on the Creek and Sangre de Cristo Creek have been evaluated by the Company with assistance from SCS and others. They were determined economically unfeasible primarily because of topography and geology of the area.

Investigations & Analysis

Water Requirements - Irrigation water management studies have been conducted in the San Luis Valley by Soil Conservation Service personnel. These studies, an evaluation using the Automatic Data Processing Irrigation Requirements Program, Company records and discussions with farm operators were used to select water use efficiencies and water demands. The studies and evaluations indicate a need for 11,360 acre-feet of irrigation water for consumptive use. Irrigation water requirements are supplied by rainfall, diverted water, pumped ground water, and from ground water accessible to the crop root system. A water table exists over an estimated ten percent of the irrigated area.

Estimated project efficiencies (percent of total supply available for consumptive use) used in the evaluation of water demand are as follows:

<u>Condition</u>	<u>Source</u>	
	<u>Diverted</u> (Percent)	<u>Pumped</u>
Future without project	32	41
Future with project	45	50

Seepage losses from canals were evaluated using Company records and by making canal flow measurements at selected locations. Company records (1961-1970) comparing water commissioner records of deliveries to the system with farm delivery records show an average water loss of 49 percent in the canal system. Losses in three reaches were checked by gaging flows through rectangular structures in the system. These figures are indicators of potential seepage loss from the canals. The losses were 23 percent of 4.4 cfs in a 2700-ft. reach; 5 percent of 2.4 cfs in a 1460-ft. reach; and 29 percent of 2.64 cfs in a 10,300-ft. reach.

Canal Design - Sizing of and management of the system is regulated by water supply, crops, soils, and availability of labor. In the upper reaches of the system where soils are porous, larger heads of water are required for irrigation than may be indicated by peak demand calculations. As a minimum an irrigation head of 5 cfs is desired for each irrigator. This quantity has historically been made available whenever possible, by rotational usage of the available stream and by supplementing diverted flows by pumping. Pumped water is shared by the users where delivery systems allow such an exchange.

Geology and Soils - Service personnel (geologist, soil scientist and engineer) reconnoitered the watershed. This review and soil survey information were used to locate potential soil and seasonal high water-table problem areas. Canal lining was planned for areas having low water table and low frost heave potential.

Engineering - Field investigations and preliminary surveys were made for use in canal design. Alternative canal locations were surveyed and evaluated. Several reaches of canal will operate at supercritical velocities. Where sharp bends or turnouts are needed in the sections, the canal grade will be reduced and the canal size will be increased to provide manageable velocities and capacities.

Fish, Wildlife and Recreation - An interagency reconnaissance was held on Trinchera Watershed with representatives from the Colorado Division of Wildlife, the Bureau of Sport Fisheries & Wildlife and the Service. The planned work will have minimal effect on recreation activities or fish and wildlife conditions in the watershed.

Environmental Assessment - An environmental assessment of the proposed project was prepared and is on file for public inspection in the Soil Conservation Service offices in Denver and Alamosa, Colorado or at the Trinchera Irrigation Company office in Blanca, Colorado. The environmental assessment did not disclose any significant affect on the human environment due to project action.

The project is of the type normally considered not to be a major federal action. There is no controversy over the installation and operation, and maintenance of the project works of improvement. Following the guidelines published in the Federal Register, Volume 39, No. 107, Part III, an Environmental Impact Statement will not be prepared.

Economic Investigations - Economic feasibility for the Trinchera Watershed was determined using information on land use, irrigation water use, and other irrigation water practices. This information was obtained from the Service and officials of the Trinchera Irrigation Company.

Crop yields used for future with- and without-project conditions were obtained from interviews with officials of the Company. These yields were agreed to by the Service.

Investigations & Analysis

The crop grown and average yields per acre are:

<u>Crops</u>	<u>Units</u>	<u>Future Without Project</u>	<u>Future With Project</u>
Alfalfa	Ton	2.25	2.5
Barley	Bu.	55.00	60.0
Vegetable Crops	Cwt.	75.00	80.0
Potatoes	Cwt.	250.00	270.0

Monetary benefits for Trinchera were evaluated as the difference in net income under future with and future without project conditions.

Other benefits will accrue from savings in operation and maintenance and replacement cost. The estimated annual cost of operation and maintenance and replacement without the project is \$93,100. With the project, the estimated operation and maintenance and replacement cost is \$56,110, excluding \$1,840 of the with project operation and maintenance cost.

Operation and maintenance and replacement cost without the project was determined by interviews with the Trinchera Irrigation Company Superintendent and by analyzing records of the Company. With-project operation and maintenance and replacement cost was determined by taking a percentage of the construction cost, plus other costs agreed to during interviews with the Superintendent. Replacement costs are the funds that are actually being accumulated annually by the Company for replacement purposes.

The value of pumping costs without project conditions was used in calculating benefits for the acre-feet of water saved through seepage reduction and increased use efficiency by installation of works of improvement.

The project lies within the Four Corners Economic Development Region; therefore, redevelopment net annual benefits of \$9,160 were calculated. Associated on-farm costs for operation and maintenance of land treatment measures needed for efficient utilization of project irrigated land and water were computed. These costs were amortized at 8 percent interest for the expected life of each measure. These annual costs, which amount to \$3,250 were deducted from the net benefits realized from increased irrigation efficiency.

Current normalized prices were used in computing monetary benefits. Structural installation costs were estimated using December 1974 prices.

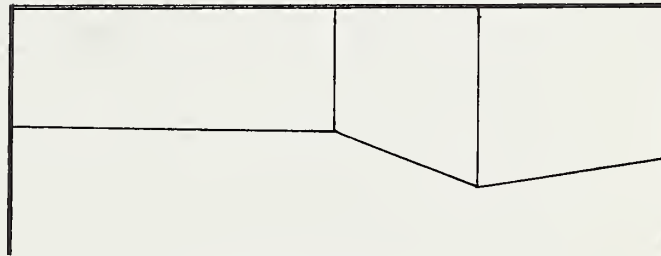
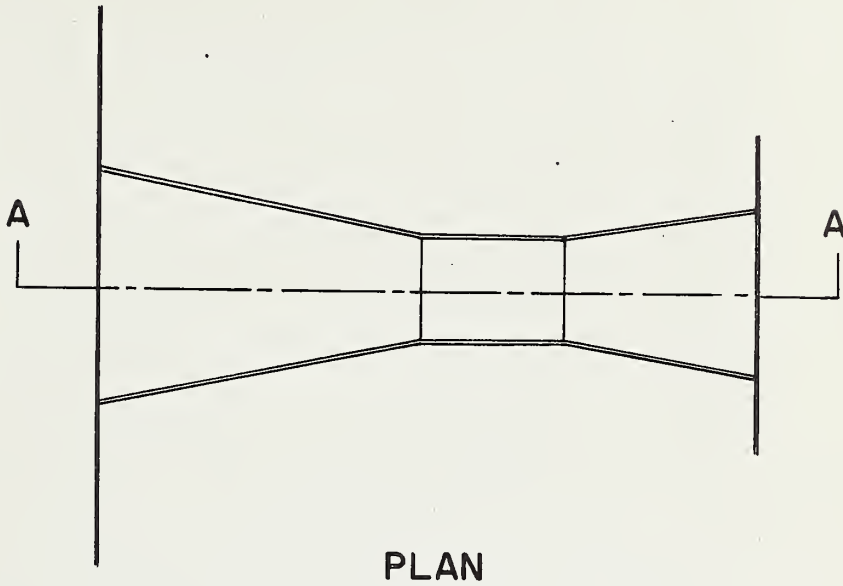
MAPS AND EXHIBITS SECTION

TRINCHERA WATERSHED
Costilla County, Colorado

October 1975



TYPICAL PARSHALL FLUME



TYPICAL LINED CANAL SECTION

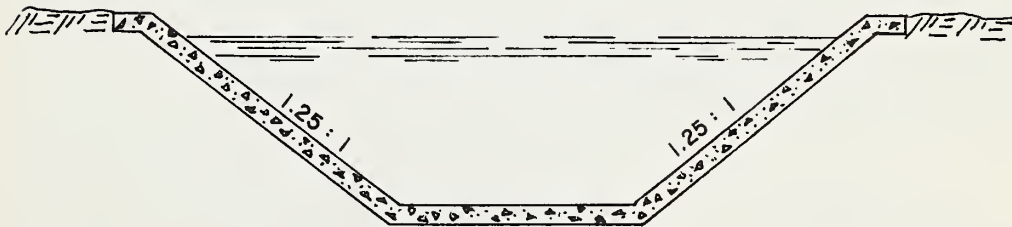
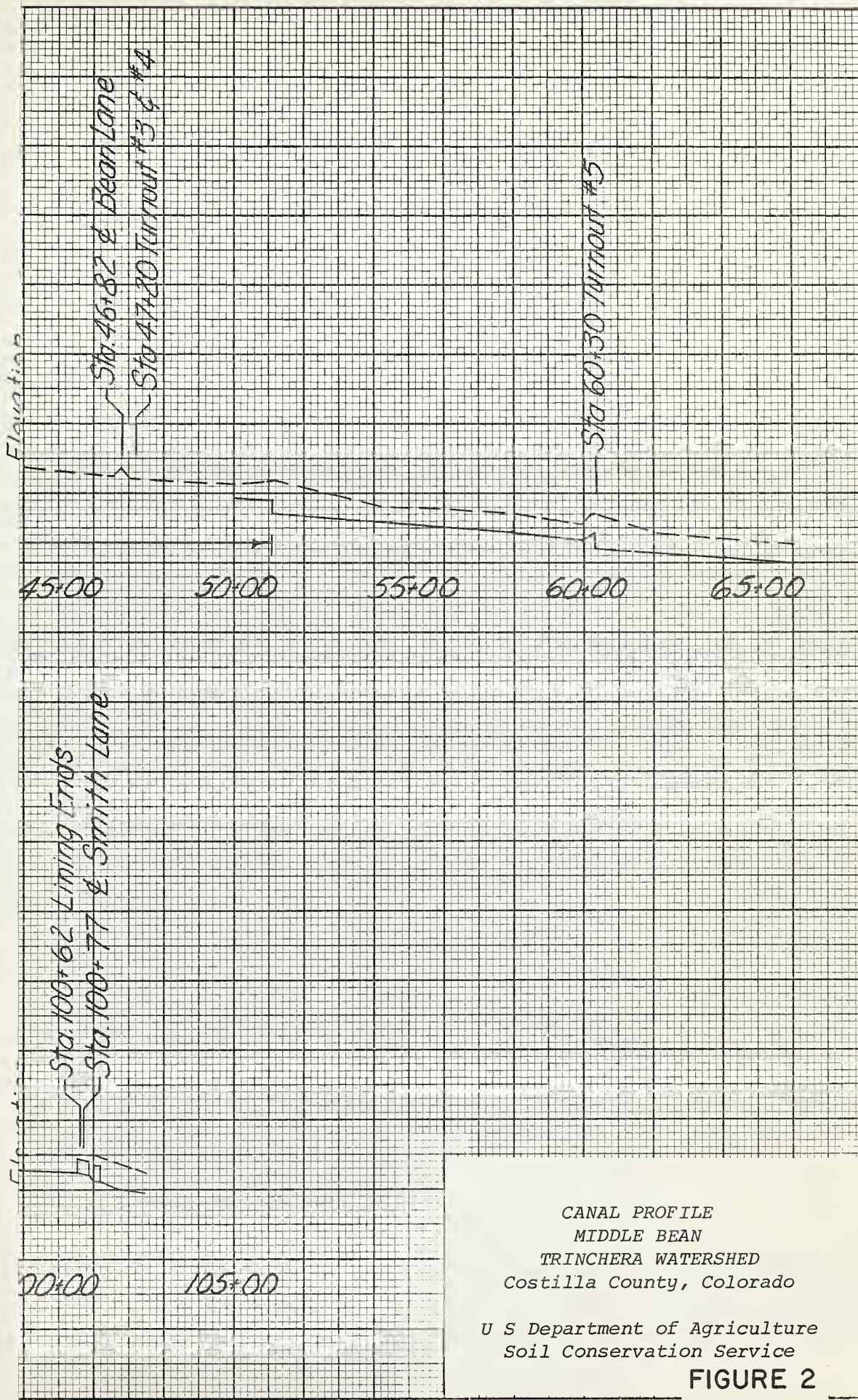


FIGURE 1

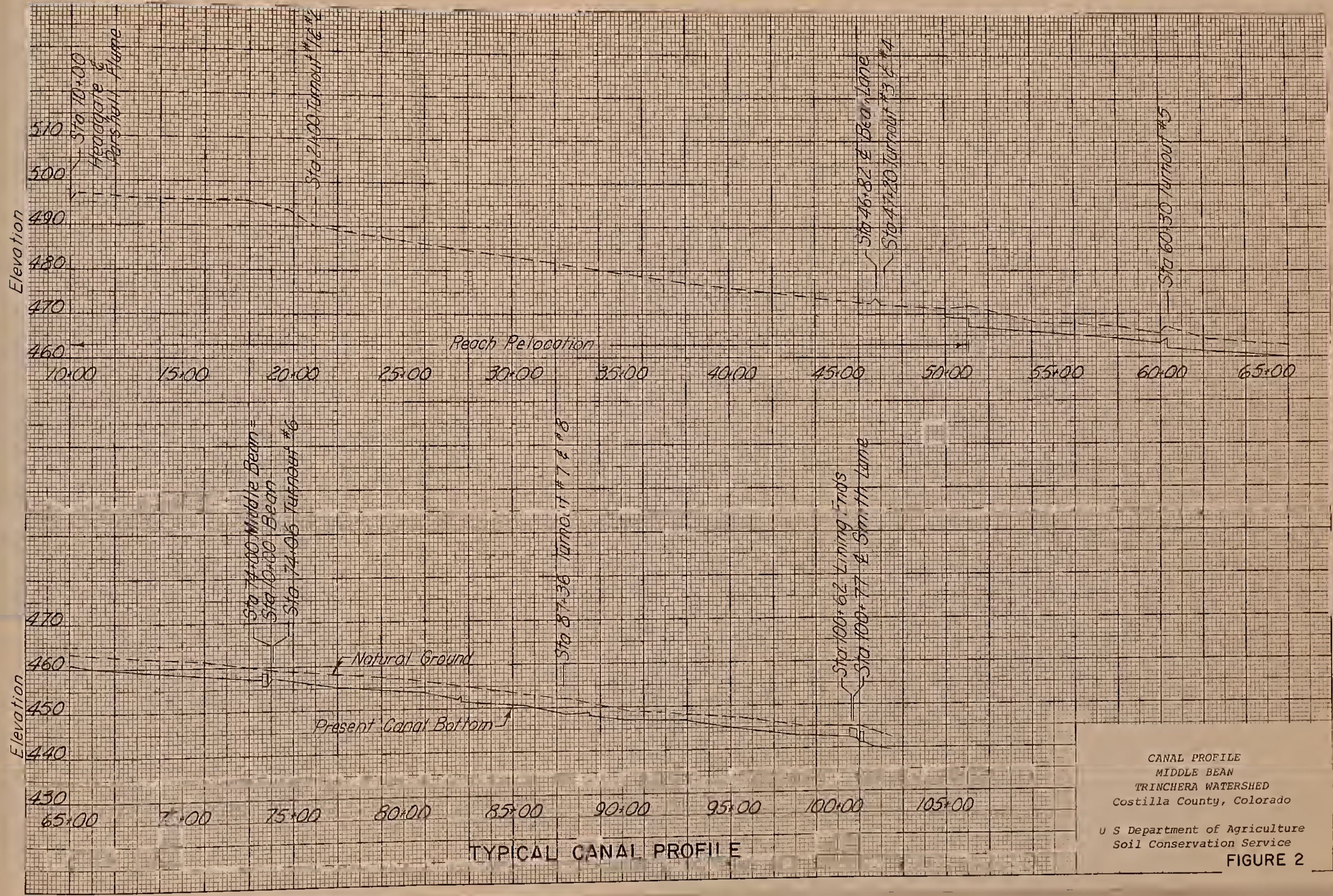




CANAL PROFILE
 MIDDLE BEAN
 TRINCHERA WATERSHED
 Costilla County, Colorado

U S Department of Agriculture
 Soil Conservation Service

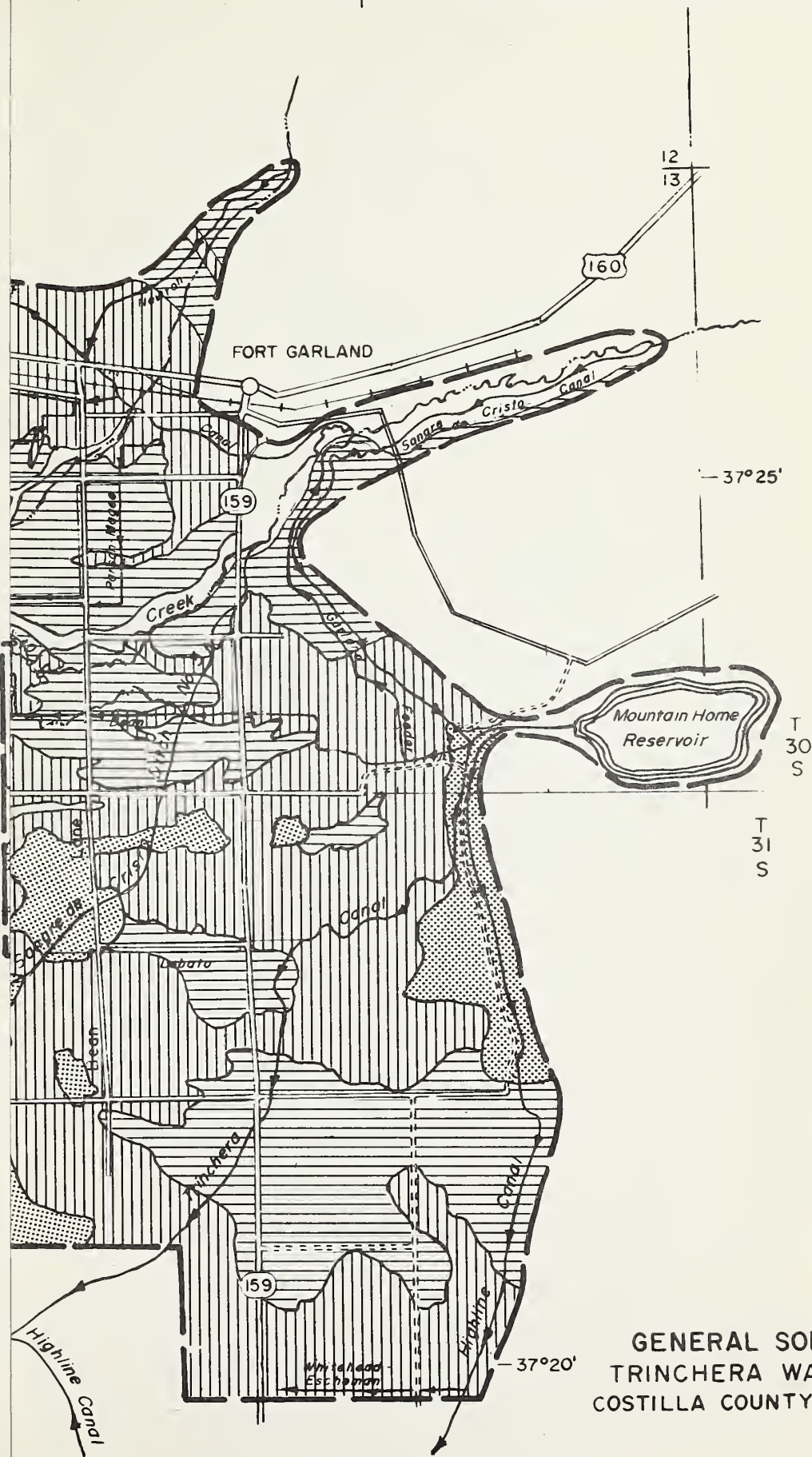
FIGURE 2



CANAL PROFILE
 MIDDLE BEAN
 TRINCHERA WATERSHED
 Costilla County, Colorado
 U S Department of Agriculture
 Soil Conservation Service
FIGURE 2

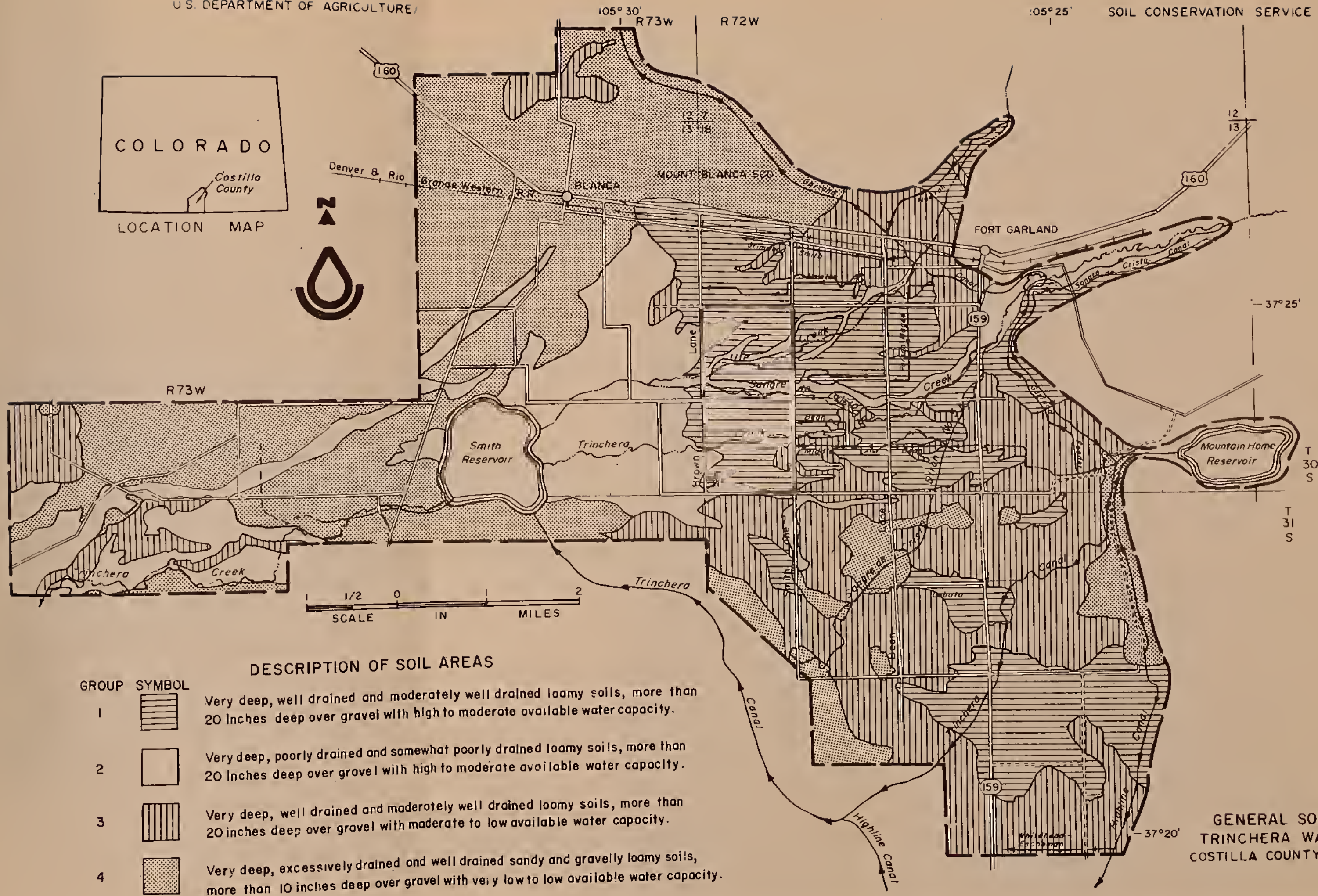
105°25'

SOIL CONSERVATION SERVICE





LOCATION MAP

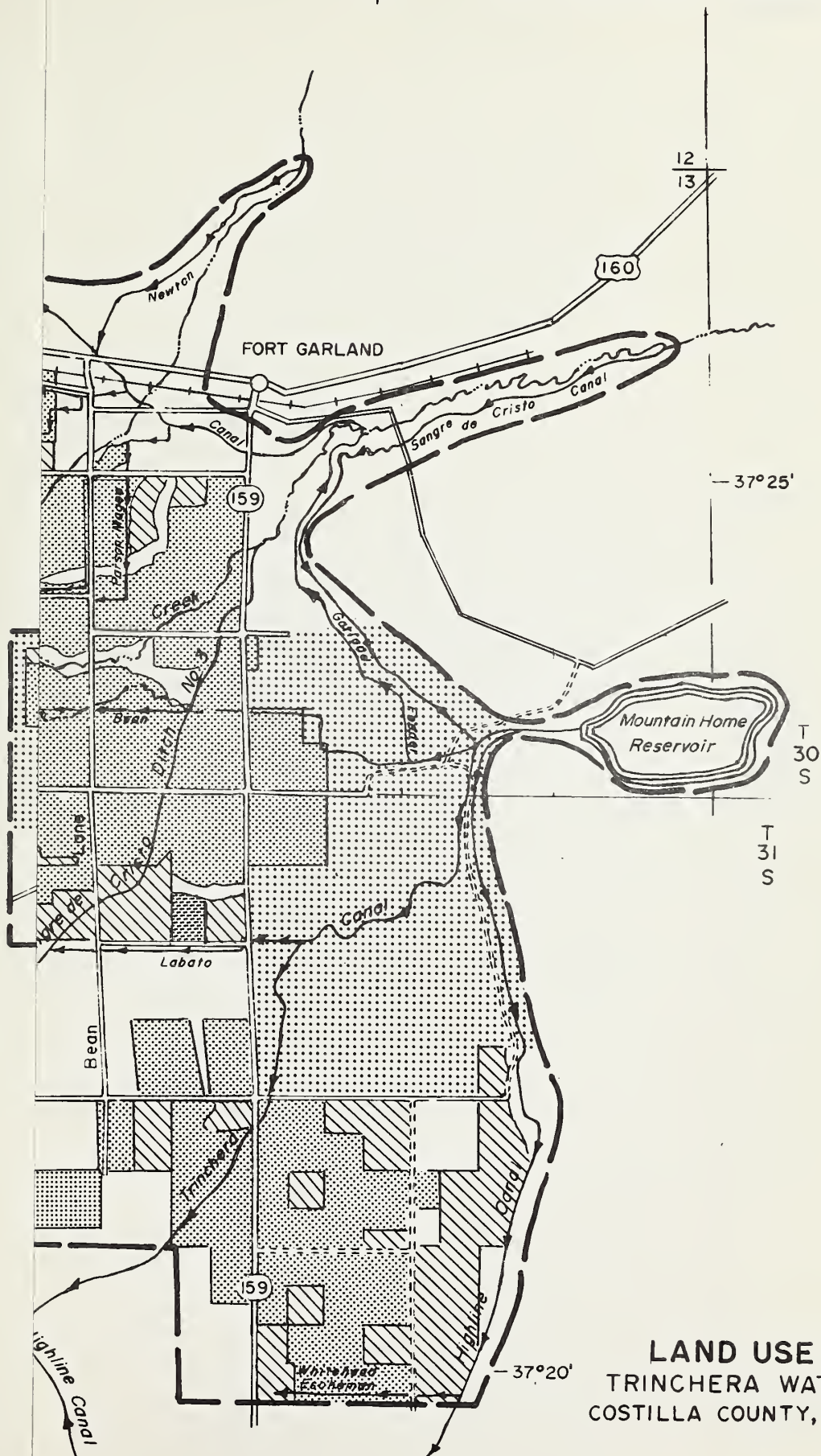


GENERAL SOIL MAP
TRINCHERA WATERSHED
COSTILLA COUNTY, COLORADO



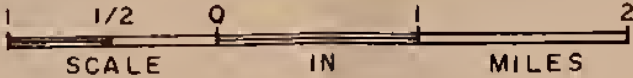
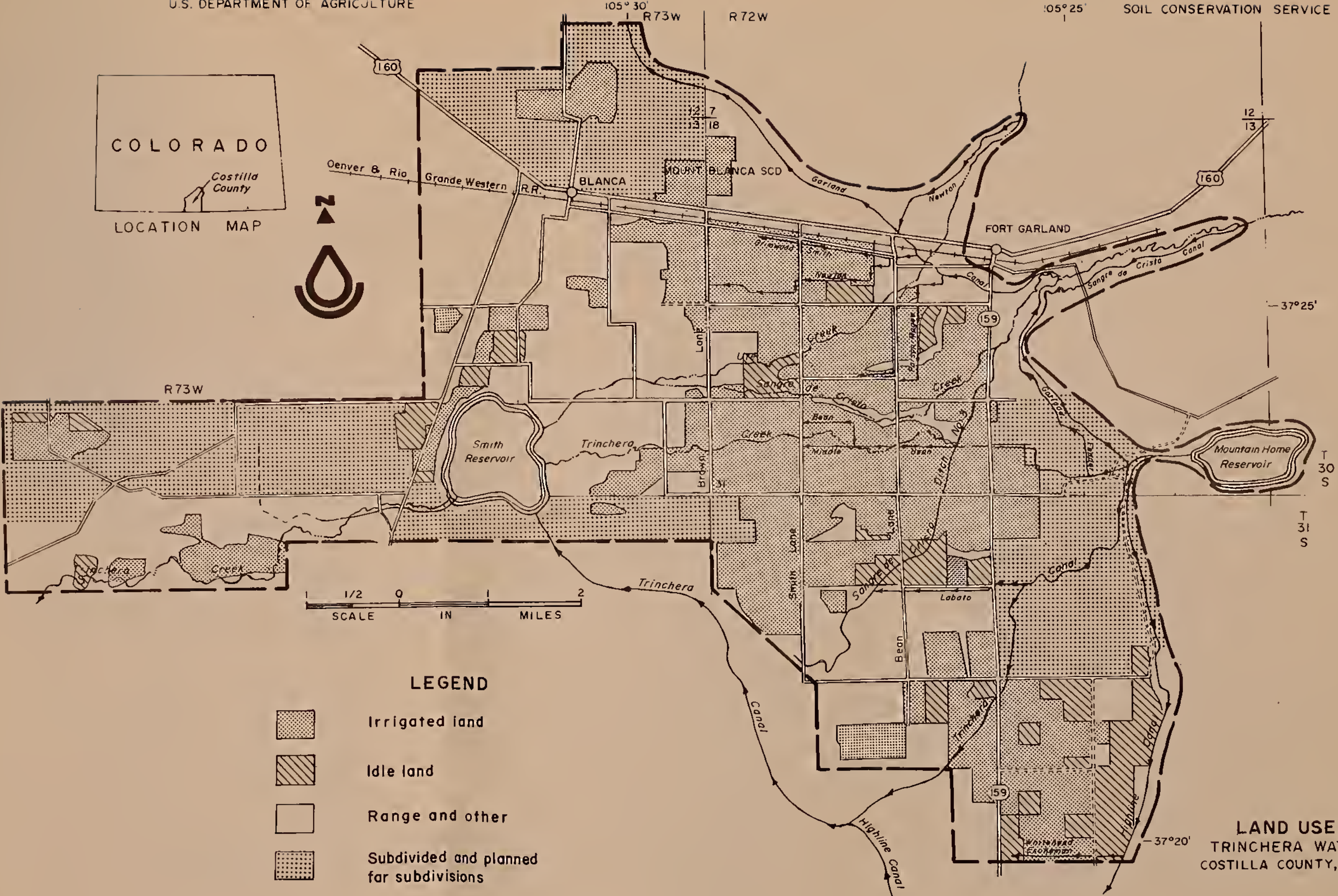
105°25'

SOIL CONSERVATION SERVICE





LOCATION MAP



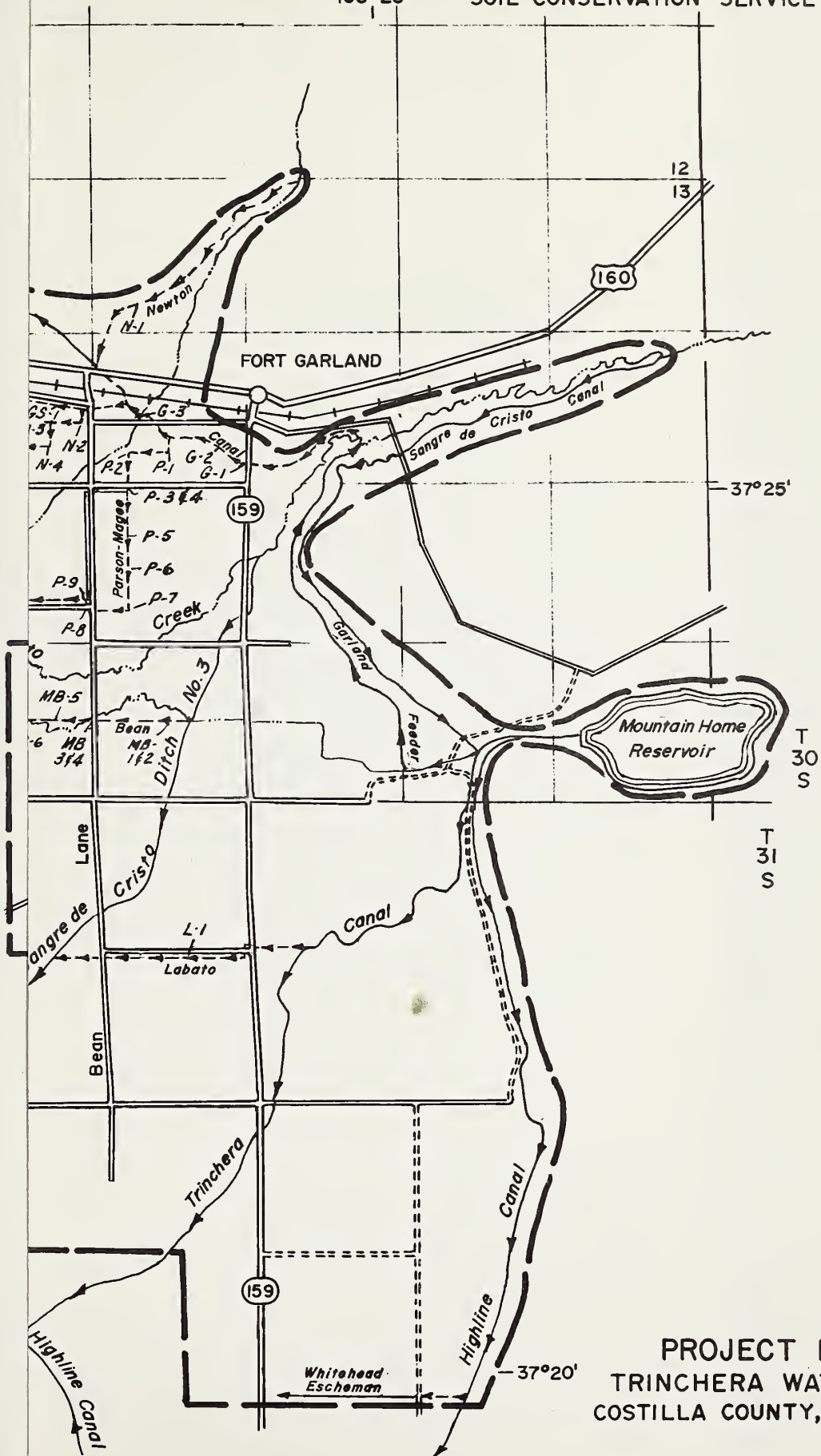
LEGEND

- Irrigated land
- Idle land
- Range and other
- Subdivided and planned for subdivisions

LAND USE MAP
TRINCHERA WATERSHED
COSTILLA COUNTY, COLORADO

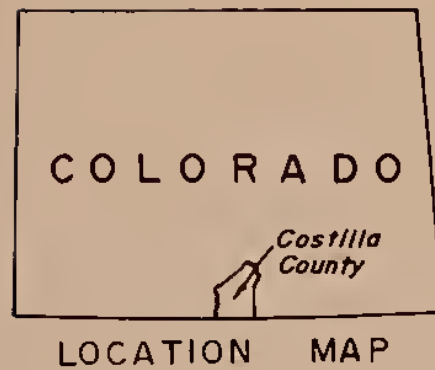


SOIL CONSERVATION SERVICE

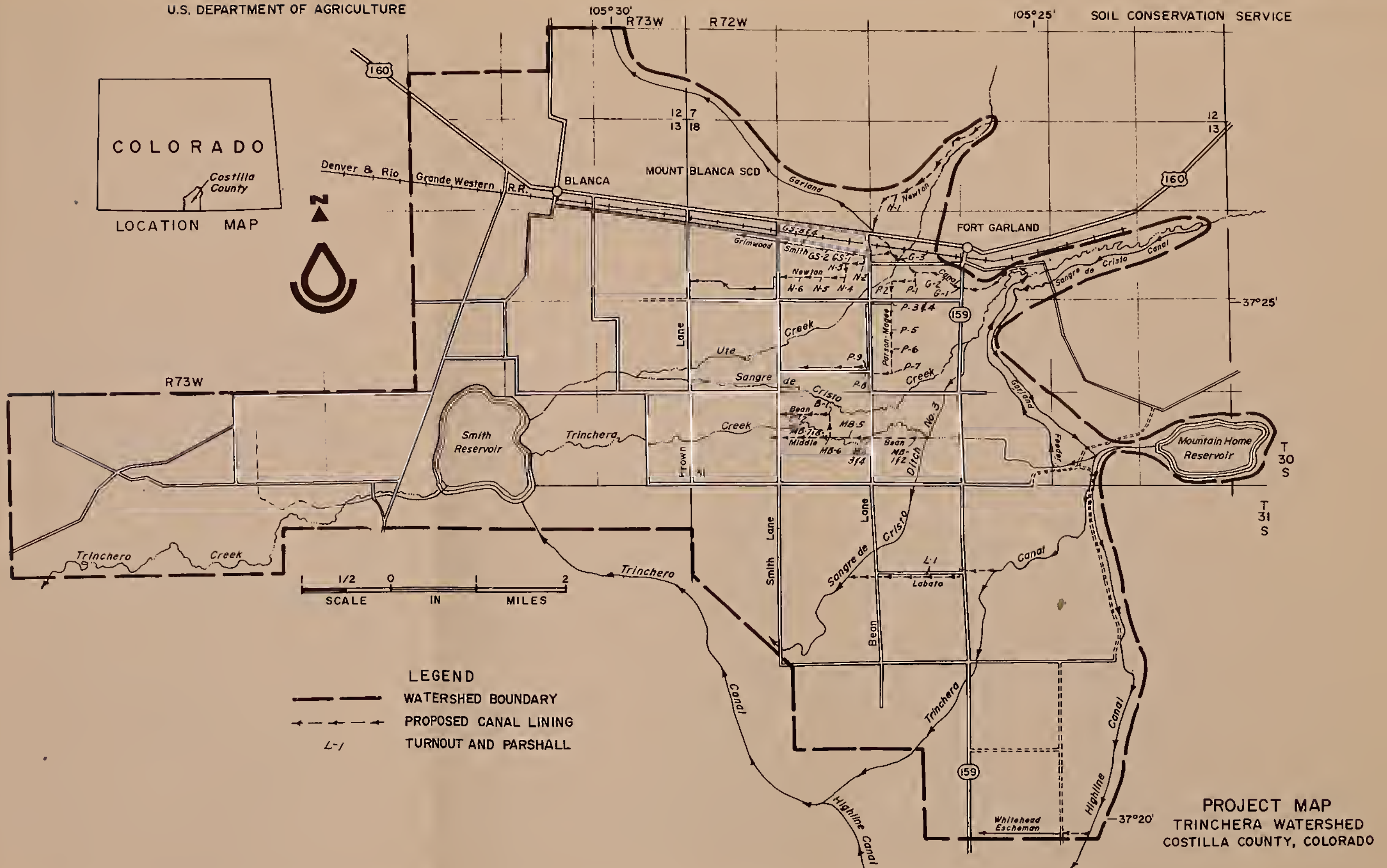


PROJECT MAP
TRINCHERA WATERSHED
COSTILLA COUNTY, COLORADO





- LEGEND**
- WATERSHED BOUNDARY
 - PROPOSED CANAL LINING
 - L-1 TURNOUT AND PARSHALL



PROJECT MAP
TRINCHERA WATERSHED
COSTILLA COUNTY, COLORADO



